

N O R M A N . A . A B E N D

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TRAFFIC OPERATIONS STUDY:

15 LOCATIONS ON CAPE COD

Prepared for

CAPE COD PLANNING AND ECONOMIC

DEVELOPMENT COMMISSION

December 15, 1970

TECHNICAL REPORT

VI

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INTRODUCTION

In looking at the fifteen locations that were chosen for analysis in this study, it becomes evident that Cape Cod communities can no longer ignore the growing traffic volumes on local as well as through roads. In some locations traffic problems can be solved by more fully utilizing available space or eliminating inefficient or conflicting designs. These are not problem intersections because they can be resolved by relatively inexpensive and simple steps.

In several cases, however, the problem with an intersection is directly related to the high traffic volumes that either approach or in some cases exceed practical capacity. When this happens, the only way to handle more traffic or existing traffic more efficiently, is to increase the number of traffic lanes by new construction. Some intersections that have capacity problems will get worse in the future. Some solutions proposed in this report are expensive but perhaps more significant, they will be painful in terms of land acquisition, removal of vegetation and impact upon existing development. These factors may cause delay or deferment of needed action.

An end to increasing traffic volumes and congestion is not in sight. Near some of the intersections that already have problems, development is continuing. New traffic generators are still being planned. At the same time no attention is paid to the impact of increased traffic on the existing road system. Poor access control and design is still prevalent in new construction although some communities show evidence of reversing the long-established laissez-faire policy on driveways.

Of greater concern is the prevalent idea that Cape Cod traffic problems can be solved by providing more and more roadway capacity. A third bridge is frequently suggested as a panacea for Cape Cod congestion. On the contrary, additional cross-canal capacity would merely permit a higher level of congestion on Cape Cod. The road system in Barnstable County is not capable of absorbing a large increase in traffic volumes without experiencing large scale traffic

problems. There are many locations not included in this report where serious congestion is incipient.

Although the Planning and Economic Development Commission has sponsored this study, the recommendations contained here cannot be implemented solely by the Commission. Based on existing patterns of intergovernmental relations, local communities must initiate the action necessary to accomplish some of the proposed changes. These patterns are based on tradition, however, and do not necessarily preclude the Planning Commission either as a catalyst or a direct participant from initiating a county-wide improvement program involving the individual communities and the Massachusetts DPW. If any county in Massachusetts is to strengthen its role in highway planning and design, it will be Barnstable County because of its unique geographic and economic situation.

The locations that were chosen by the individual communities, either by their police chief or board of selectmen, do not necessarily represent the worst locations on Cape Cod. An attempt was made to pick locations where improvements could reasonably be expected to be made within a relatively short time, possibly by the 1971 tourist season. Some of the recommended improvements, however, are expensive, and their immediate implementation is unlikely.

Representatives from individual communities will, of course, find the section dealing with their own town of greatest interest. In choosing locations an attempt was made to provide the greatest possible variety of situations so that the towns might benefit from each other's experiences. This was one of the objectives of the study.

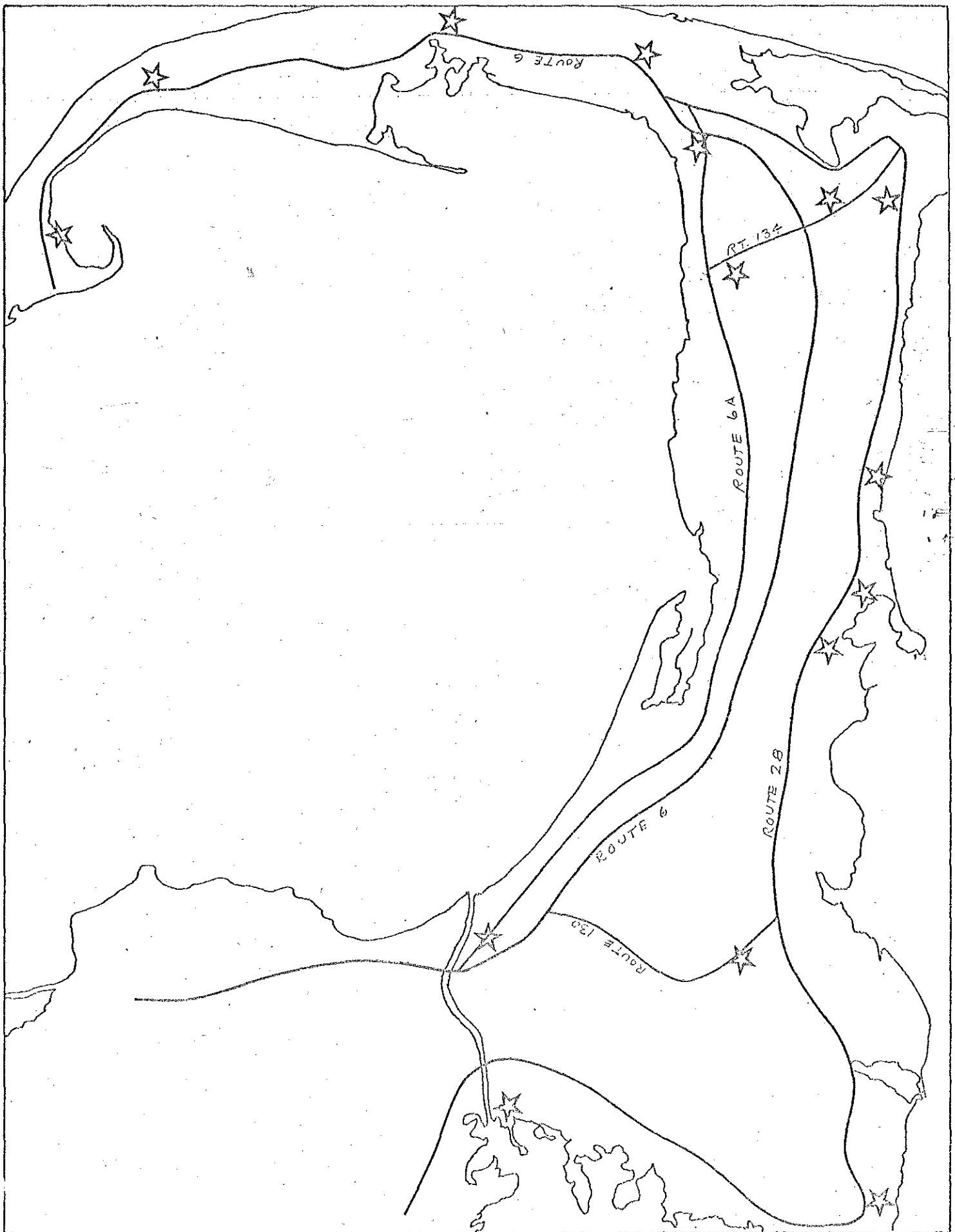
About two-thirds of the locations are on Route 6, 6A or 28. Improvements on these roads will involve the coordination, approval or direct involvement of the Massachusetts Department of Public Works. Because of their responsibility for these state roads, the DPW must necessarily be a party to these improvements.

The DPW can provide design services and engineering advice. But local communities must provide the impetus for any changes, must take the initiative in promoting these improvements.

The report does not provide a comprehensive improvement program for traffic simply because the individual improvements have to be made within the context of each town's requirements and desires. Also, this report is by no means a complete dossier of traffic problems.

From the Commission's point of view, the report does raise a basic question. Should the Commission support a broad county-wide effort to raise the level of traffic service to meet demand on Cape Cod, or should the towns continue on their present course of wrestling with their own traffic problems individually?

Each location has been treated separately. For each intersection a complete physical inventory including photographs was made to locate all features that could have an effect upon existing or proposed conditions. A four hour traffic count of all turning movements was made to identify major and minor traffic flows and to see if roadway capacity was part of the problem. Most counts were made between 1:00 and 5:00 p.m. which includes the busiest part of the day during the summer. The Massachusetts DPW provided control figures from its permanent counter on Route 6. In addition the District Office of the Department has been most cooperative in providing assistance as requested.



Selected Locations

Figure 1

PROVINCETOWN

Bradford Street and Standish Street

General Discussion

That this intersection was chosen is not surprising. Even though it is basically a right angle four way intersection, the presence of another minor road intersection, channelization which has questionable value, and the almost total lack of any sideline designation make this intersection very confusing for motorists, especially tourists who are not familiar with the town's street system. In addition to these deficiencies, there are few traffic controls at the intersection that would assist motorists.

The intersection lies in a critical location. Nearly all the traffic either passing through or headed for the center of Provincetown goes through the intersection. Traffic speed is low at the intersection, partly because of the generally low speeds in the center of town and partly because over one third (35%) of the approach traffic is composed of turning movements. (See Figure 2.) Traffic safety is good; the greatest problem at the intersection and the reason for studying it is the frequent congestion that occurs here at even moderate traffic levels.

Problems

Some of the problems which cause traffic congestion were hinted at in the section above. A major deficiency is that motorists using the intersection have no clear idea as to where they should be in approaching or leaving the intersection. One obvious problem is the traffic island which creates more confusion than it prevents. Left turning traffic from Bradford into Standish

may make a left turn either before or after the island since there is no indication as to which one is preferred or required.

The complete lack of definition between the right-of-way and abutting gas station aprons on three corners is an obvious obstacle in terms of trying to control traffic; however, the situation has to be considered in the light of alternatives. It is possible that the construction of a non-mountable curb at the property line which would limit gas station access to prescribed driveways could have the effect of reducing the capacity of the roadway. For example, at the present time, while traffic is waiting to make a left turn into Standish, through traffic frequently passes by on the right, often utilizing gas station property. Furthermore, the construction of curbs might encourage curb stopping and even parking which would reduce the rather limited capacity of the intersection as it now stands.

The island in the middle of the intersection is improperly located. Presumably it was placed there as channelization for the right turn from Standish to Bradford. While it accomplishes this, the reverse movement often takes place on the wrong side of the island; furthermore, the left turn from Bradford into Standish is forced to make a very sharp left turn which causes problems.

The only control at the intersection is the STOP sign on Standish Street westbound. This is a minor street and the STOP sign here should remain. Sight distances at the intersection are good so that this factor does not enter into any existing problems.

The basic problem at the intersection in addition to the large volume of cars is the lack of roadway definition and positive traffic controls.

Recommendations

As the first step, sidelines denoting the separation between the right-of-way and private property should be painted on the three corners where there are gas stations. This would help define the travelled way and would discourage encroachment by abutters. A second step should be the painting of center lines and stop lines for those movements of traffic which are to be stopped. In addition to the Standish westbound STOP sign, an additional STOP sign should be placed for traffic eastbound on Standish Street making a left turn into Bradford.

Right turning traffic from Standish into Bradford should be controlled by a YIELD sign since this movement is definitely less important than the southbound through movement on Bradford.

A second major improvement following the line painting program would be the relocation as shown in Figure 3. The intersection needs channelization because of the large expanse of pavement confronting motorists. The present island, however, seems to get in the way of some important traffic movements without helping to define travel lanes. Relocation of the island so that the right turn from Bradford into Standish is made into a single one way lane would also help the left turn from Bradford into Standish by defining the correct place to turn. Another (painted) island should channel traffic north of Standish. Parking would still be allowed. This channelization would have the effect of defining the basic intersection between these two streets.

In looking at the total picture in Provincetown, the street pattern suggests the possibility that a one way system might be effective during the summer months. This would involve making Standish Street one way eastbound,

from Commercial to Bradford, and Ryder Street one way westbound from Bradford to Commercial (toward the pier). Commercial Street would be made one way southbound between these two streets. At Ryder Street there is sufficient room to provide a left turn lane on Bradford while allowing straight through traffic to continue, although this would involve the removal of a few parking spaces. The one way system would solve the problem at Bradford and Standish by eliminating the left turn toward Macmillan Wharf. Traffic on Commercial Street would make a right turn on Bradford or a left turn onto Macmillan Wharf. The pattern would not affect the traffic leaving Macmillan Wharf for Route 6. Traffic from Bradford Street headed toward Macmillan Wharf would be required to travel one more block. The one way system could be implemented with no change in street lines or construction of islands. It would require the erection of a number of directional and other regulatory signs; however, this represents a minor cost. The new channelization proposed at Bradford and Standish would be just as effective in controlling traffic at the intersection with either a one way or a two way system.

In summary, in view of the low speeds at the intersection plus the fact that Provincetown represents the end of the line for most traffic coming through here, there is no great pressure for making this intersection carry more traffic. The recommendations relate mostly to improving the intersection so that traffic using it can do so more easily during peak periods.

TIME PERIOD
From 1pm
To 5pm

VEHICLE VOLUME
SUMMARY SHEET

Date JULY 24 1970
Weather HOT

LOCATION BRADFORD & STANDISH STREETS, PROVINCETOWN

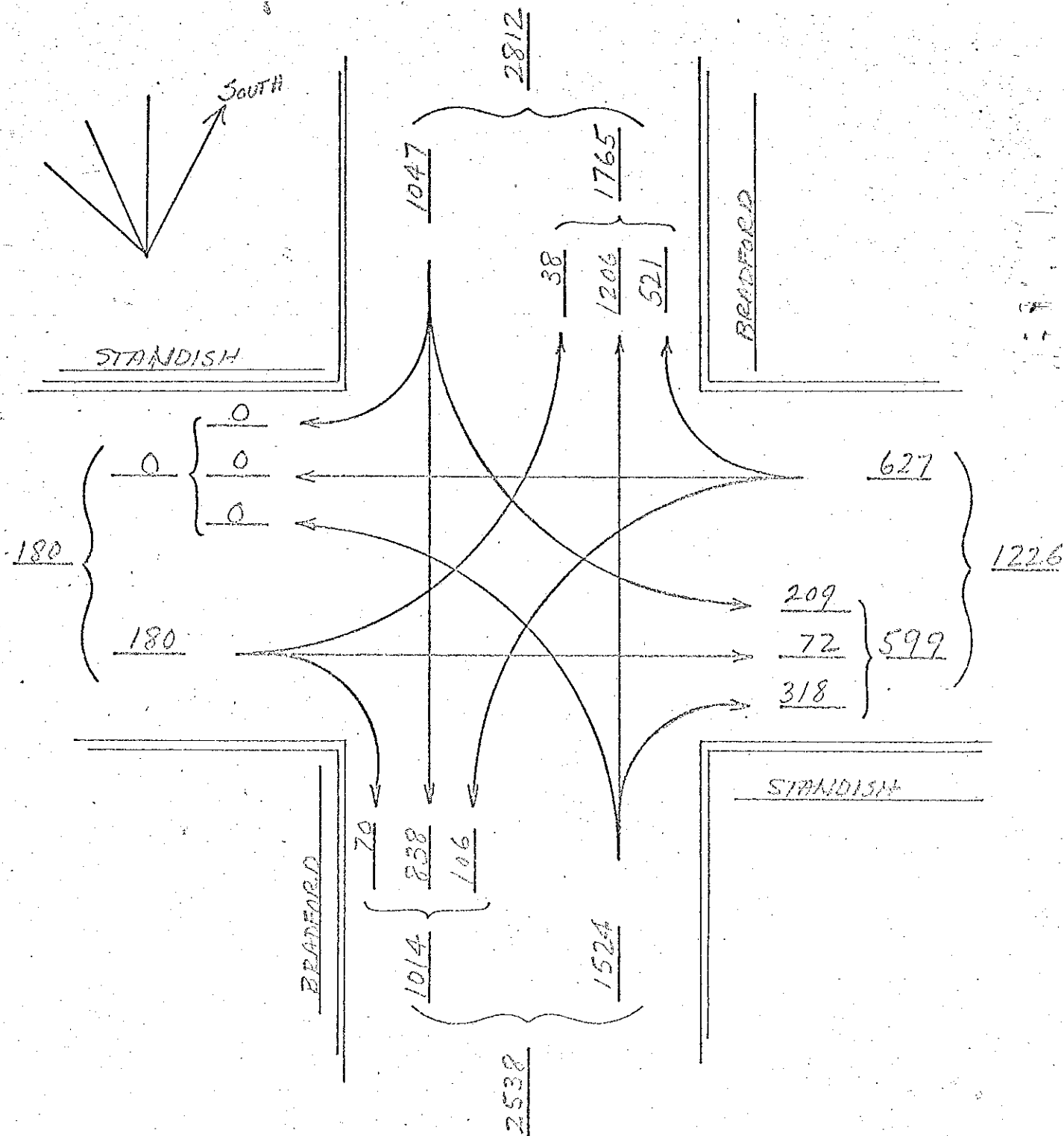
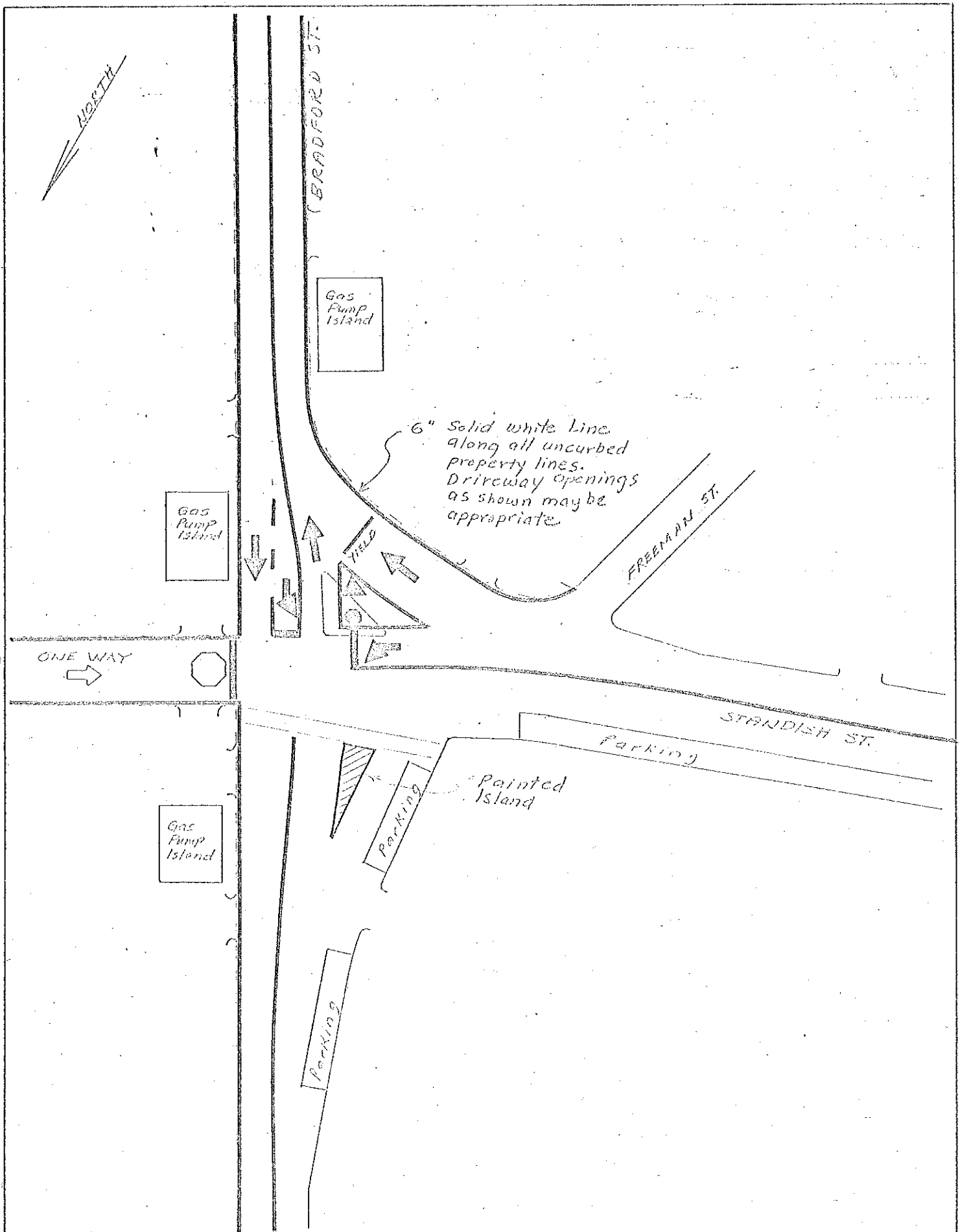


Figure 2



Bradford Street and Standish Street, Provincetown

Figure 3

TRURO

Route 6 and Route 6A Intersection

General Discussion

This intersection is a major junction between the shore and inland routes to Provincetown. For northbound traffic headed toward Provincetown it involves a major decision, since the guide signs point out that Provincetown may be reached "either way." For the experienced traveller and residents, this is no problem; he already knows which route to follow and which lane to be in at the intersection. For the novice, however, this is not the case. While indicating that Route 6A is a "shore road" the signs do not clarify which direction provides a more scenic drive, an important consideration for tourists. One third of northbound traffic on Route 6 makes a left turn at 6A. (See Figure 4.) Apparently, a number of people choose 6A because of its "shore" scenic value, although some obviously use the road to reach a local destination. It is the heavy left turns into 6A which cause occasional back-ups at the intersection and which create a continual traffic hazard because of the heavy volume and moderately high speed of traffic.

In view of the higher traffic capacity of Route 6 and because 6A has extensive roadside development consisting of continuous open driveways and parking areas serving motels and cottages as well as private homes, an effort should be made to more fully utilize Route 6. While this might be of some concern to businessmen on 6A, the closeness of 6 and 6A as well as the excellent visibility from one road to another (combined with limited accommodations in Provincetown), it should prevent any problem.

Problems

Two basic problems associated with this intersection are 1) lack of a left turn storage lane for northbound Route 6A traffic and 2) lack of intersection identification. The actual intersection is difficult to see for both north- and southbound traffic on Route 6 even though visibility in both directions is good. Because of topography and partially because of an absence of the usual forest of signs, signals and posts which accompany an important intersection, the specific left turn location for northbound traffic is not clear until the motorist is on top of the intersection. For southbound traffic, the motorist is unaware that he is approaching a major conflicting left turn movement.

Because of the frequent delay in decision-making by northbound motorists both lanes of northbound Route 6 are often stopped as tourists decide which way to go. The capacity of the intersection and all roadways is much greater than the traffic volume.

Recommendations

On a longer term basis, it may be possible to justify the construction of a separate left turn lane at this intersection, possibly signalized. Decisions concerning the relocation or reconstruction of Route 6 in Eastham and Wellfleet to the south have yet to be made and carried out before any serious thought will be given to this portion of the highway. In view of the limited potential for traffic generation north of the intersection, in the future, it is quite possible that the present width and design of Route 6 would be sufficient for an indefinite period of time. To insure that the situation will not deteriorate, a first step should be to establish some type of right-of-way control on Route 6 in the immediate vicinity of the intersection at

least a half mile in each direction. One reason why the intersection operates as well as it does in view of the heavy summer traffic volumes is the lack of interference from abutting land uses. Should this situation change, it will be necessary to consider a by-pass of the area involving major construction. Establishment of some type of right-of-way control could forestall this indefinitely.

It is possible that the State Department of Public Works would consider the construction of an additional northbound lane at the intersection so that one of the present lanes can be utilized completely for left turns. However, this is not needed at the moment since it is possible to carry northbound Route 6 traffic in one lane. The recommendations below are designed to keep that lane moving.

In order to alleviate the motorists' decision-making dilemma at this intersection, it is recommended that the northbound directional signs series be revised. (See Figure 5.) The sign located approximately 1,250 feet from the intersection which reads, "6A Shore Road, North Truro, Provincetown, Next Left," should be re-worded so that the bottom line reads "Left Lane." Prior to that, located at an appropriate distance, should be a new sign reading, "Route 6, Provincetown, National Seashore, Keep Right." The sign which now reads "North Truro Provincetown Either Way," which is located just at the intersection, should be replaced by a directional sign which shows "Provincetown" and "Truro" with arrows. The directional sign at the gore facing northbound which says "6A Shore Road, North Truro, Beach Point, Provincetown" should be replaced by a sign which merely says, "6A Shore Road."

The purpose of these changes is to have the decision-making process occur prior to the intersection. In this regard, the "North Truro, Provincetown, Either Way" sign is not helpful.

To further separate left turns from through traffic, it is recommended that for a distance of 500 feet approaching the intersection from the south, the dashed line should be replaced with a solid line. This would help to separate left turn traffic from through traffic and should help to prevent the blockage of the through lane. This section of road should be designated NO PASSING in the northbound direction. Passing opportunities for northbound traffic are ideal just beyond the intersection. To help identify the intersection, a solid transverse line should be drawn or painted on the pavement to specify where the left turn should be made. The existing island at the throat of 6A dictates where the left turn must be made. In addition to the recommended changes in directional signs, a standard route junction sign should also be used to forewarn motorists of this intersection.

For southbound traffic the single 30" side road warning sign located 360 feet away does not adequately convey the importance of the intersection to the driver. At the very least, a merging sign should also be placed prior to the intersection because the Route 6A entering traffic is not controlled by a STOP or YIELD sign. An alternative would be to relocate the 48" ROAD NARROWS sign from a point south of the intersection to a point between the gas station driveways. While technically less correct, the relocation of this large sign could have the effect of alerting motorists prior to the intersection that the road changes from a high-speed four lane facility to a narrower road that will involve lower speeds and greater caution. The existing flashers have a useful warning function and should remain.

The Route 6A approach is adequate in terms of signing and design and no changes are recommended here.

One other improvement which would help at night would be to more fully illuminate the intersection. At the present time there is a single luminaire located directly opposite Route 6A on Route 6. This is the same treatment given to much less important intersections. This would have no affect on daytime traffic but since Provincetown generates traffic at night, the additional lighting may be justified.

TIME PERIOD
From 1 pm
To 5 pm

VEHICLE VOLUME
SUMMARY SHEET

Date FRIDAY JULY 17, 1970
Weather HOT

LOCATION ROUTE 6 and 6A TRURO

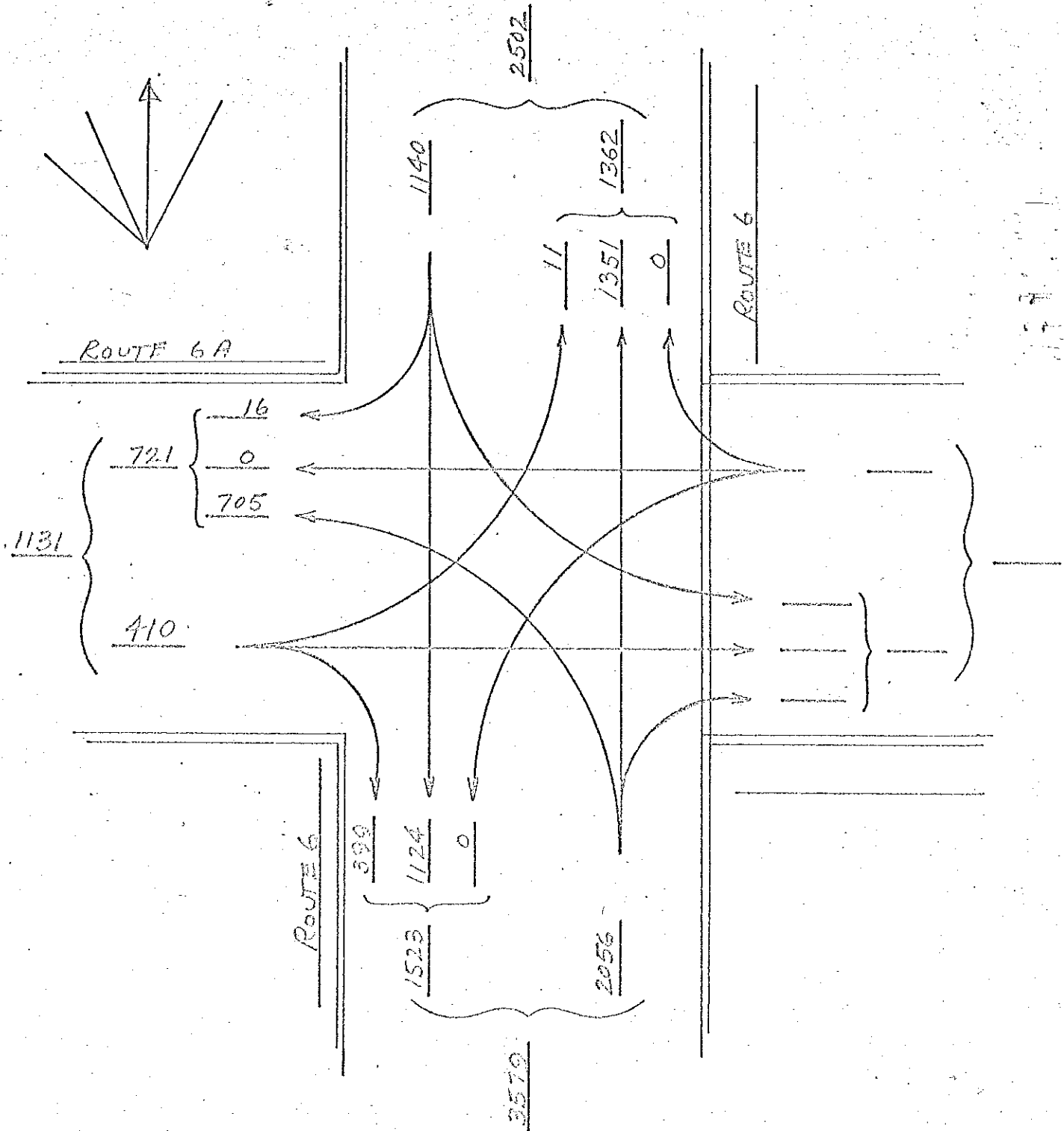
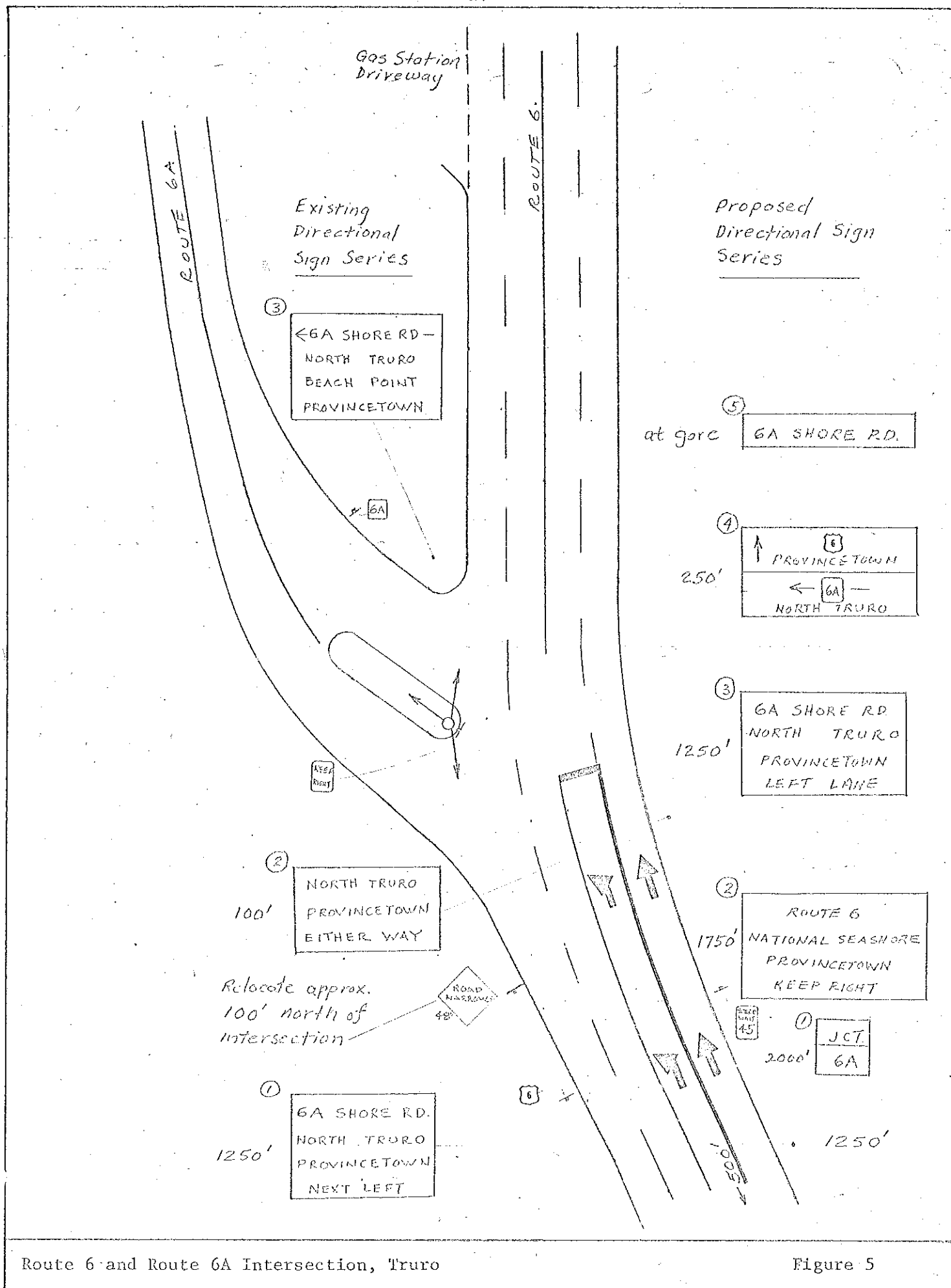


Figure 4



Route 6 and Route 6A Intersection, Truro

Figure 5

WELLFLEET

Route 6 at Marconi Station

General Discussion

Since the development of the National Seashore headquarters at this location, the intersection has been rebuilt and a semi-actuated traffic signal has been installed. Traffic volumes on the access road are light as shown in Figure 6 and the intersection itself is not a problem. The reason that this intersection was chosen is because of the change in roadway width for northbound traffic. Route 6 changes from a three lane road to a four lane road only 435 feet before the intersection. However, only 375 feet north of the intersection, the roadway changes back to a three lane roadway.

Problems

The problem at this intersection is quite simple. Northbound traffic approaches the signalized intersection in two lanes. Just 150 feet north of the intersection is the first warning that the road narrows --- a "Road Narrows" sign. Except for the disappearance of the dashed line, there is no other indication that the road narrows. Partly hidden because of the topography, the right lane suddenly disappears and the left lane is the only one that is useable. There are no markings on the pavement to indicate the transition. Furthermore, the transition occurs at a point where there is both horizontal and vertical curvature. This has the effect of hiding the lane change from the oncoming motorist. If this situation occurred in a dip where motorists could see the roadway for some distance ahead, the problem would not exist.

When traffic is light there is no problem since there is much less than one full lane of moving traffic. During periods of high traffic volumes, especially when northbound traffic is required to stop at the light, both lanes fill up with through vehicles. When the green indication occurs, traffic moves forward as a platoon and reaches the transition before it has had a chance to establish the longer headways normally associated with faster-moving traffic. As a result, an abrupt merging movement occurs. If the intersection did not exist and greater advance warning were given, even with the sight distance restrictions, the transition to a narrower roadway would not be such a problem. Redesign and construction of the roadway which created the short four lane section and the signal have caused a problem here. Had the four lane section been lengthened northward, the problem would not have arisen.

Recommendations

There are two ways of treating the problem. One way is to restrict the approach to the intersection by having the right lane reserved for right turning movements only. A second way is to extend the four lane cross-section northward so that the transition occurs in an area of better sight distance and at a point where traffic that has been platooned at the intersection waiting at the traffic signal has had a chance to spread out.

In regard to the right lane for right turns, this could be done at practically no cost since some additional road markings and a few signs are all that would be needed. A disadvantage would come from the reduction in intersection capacity. Most of the time this lane would be empty since the right turn movement is so light. During periods of high volume, it is quite possible that northbound through traffic would use the right lane anyway in

violation of the regulation. During peak periods, because of a heavy volume of approaching traffic, it is possible that some vehicles would have to wait for more than one traffic cycle to clear the intersection. This would be undesirable from the standpoint that an isolated semi-rural intersection causes such inconvenience.

The most desirable way of treating the problem here would be to extend the four lane cross-section for approximately one half mile northbound. This would have the effect of removing the transition zone from the immediate intersection area. It would not only place the transition zone in a more visible location, but the distance would help to dampen the platoon effect caused by the signal.

The additional widening is a simple operation. The pavement should be widened 12 feet. The construction could take place within the present right-of-way of Route 6. If necessary, the widening could be done at the expense of eliminating any established shoulder for this short distance. This type of design is used at other locations where widenings are necessary within a narrow right-of-way. Although there has been a great deal of discussion about the possibility of a by-pass for Route 6 in this area, the likelihood of any new construction within the next ten years is doubtful. Therefore, this modest construction project should not be deferred on the basis of an impending by-pass.

TIME PERIOD
From 8:30 a.m.
To 12:30 p.m.

VEHICLE VOLUME
SUMMARY SHEET

Date FRIDAY JULY 17, 1970
Weather HOT

LOCATION ROUTE 6 at MARCONI STATION ROAD

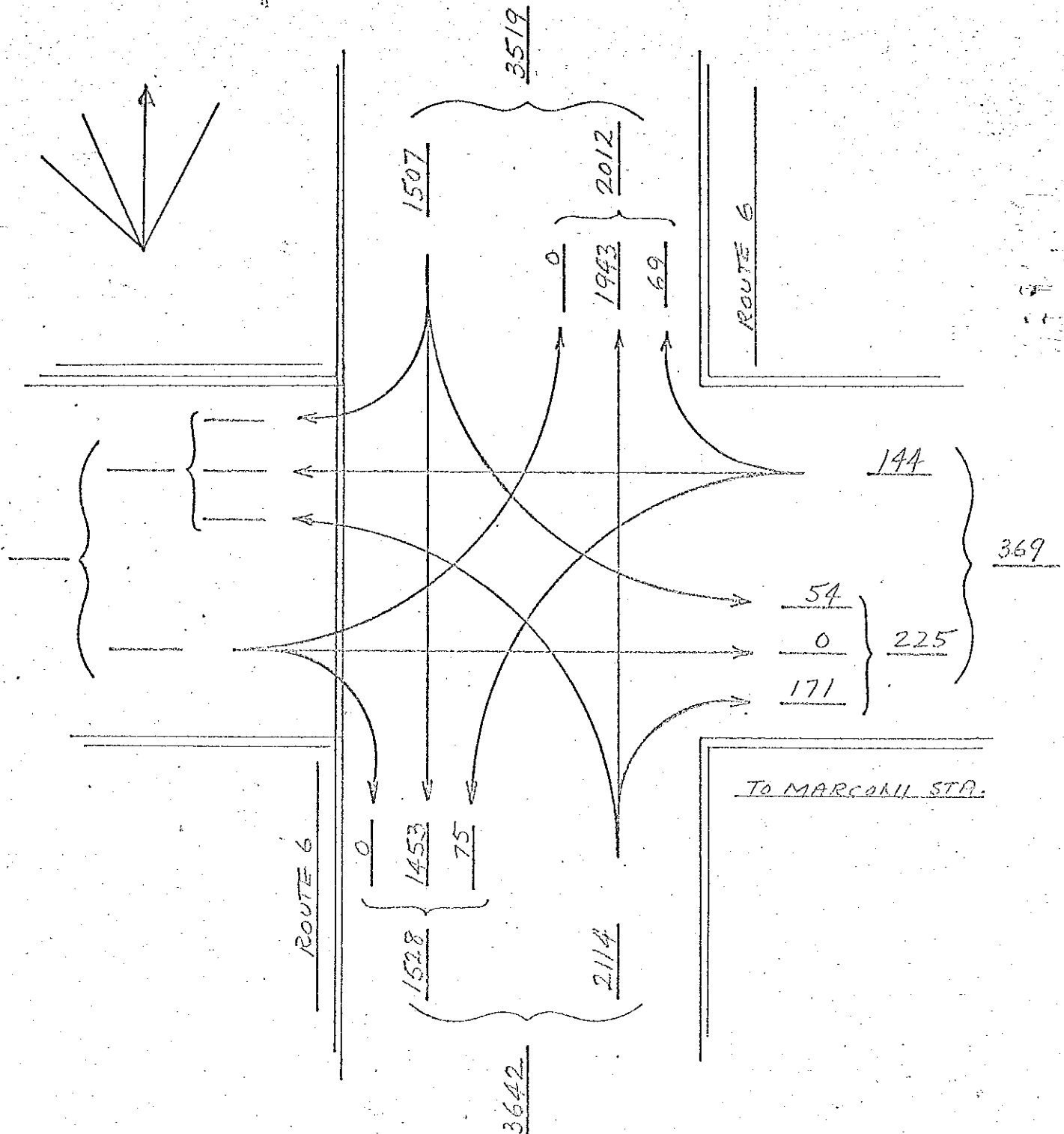
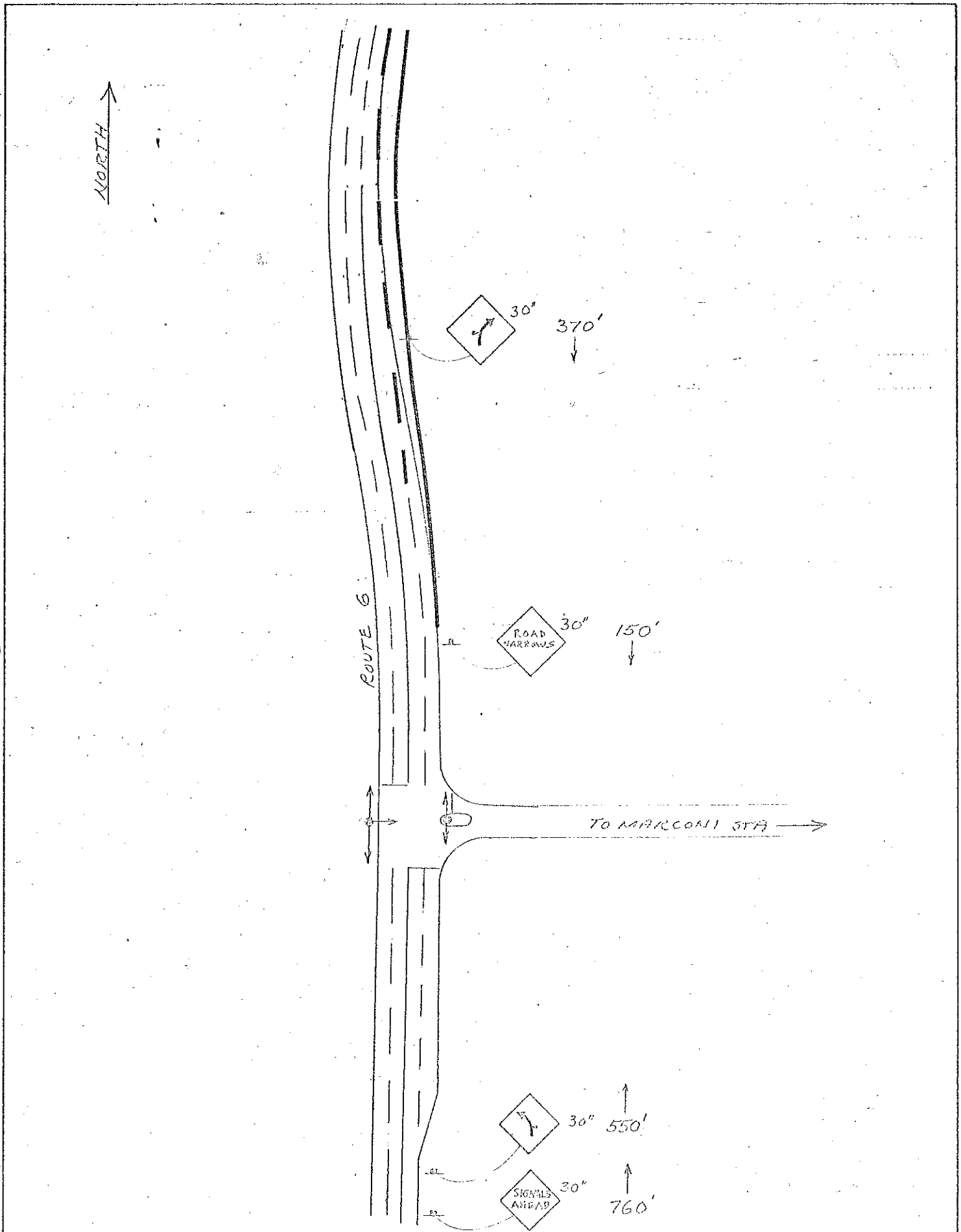


Figure 6



Route 6 at Marconi Station Road, Wellfleet

Figure 7

EASTHAM

Route 6 and Governor Prence Road

General Discussion

This intersection was chosen by the Selectmen because of a proposal contained in the National Seashore master plan which would increase the parking capacity at Hemenway Landing to about 60 cars. Aside from the traffic that would be generated by the site, there is little other traffic on Governor Prence Road east of Route 6. This road would not be used as an access to any other parts of the National Seashore, nor to any other proposed intensive land uses.

If it is assumed that each parking space is used about four times each day, then the total traffic volume on Governor Prence Road would be in the vicinity of about 500 vehicles per day. On Route 6 in front of the information booth, the volume is 22,000 vehicles per day. While 500 cars is a small volume, both intersections of Governor Prence Road with Route 6 are hazardous. The National Park Service has requested that a traffic signal be installed at this location to provide safety for vehicles turning into and out of Governor Prence Road. No action has yet been taken by the Massachusetts Department of Public Works; however, they have consented to conduct a study.

Problems

As Figure 8 shows, Governor Prence Road east of Route 6 is "U" shaped. At both intersections with Route 6, vertical and horizontal curves make movement into or out of Governor Prence Road difficult. The Eastham information booth was moved a few years ago from the south intersection of Route 6 to the north intersection of Governor Prence Road and Route 6 in order to

improve traffic conditions. Left turns from Route 6 into Governor Prence Road are particularly hazardous because of the short sight distance southbound due to horizontal curvature and the limited sight distance of oncoming motorists due to vertical curvature. Thus, a southbound car turning left at the Eastham information booth risks a rear end collision while waiting and being hit broadside by oncoming traffic while making the left turn. At the south intersection, a left turn into Route 6 is difficult because of the horizontal curvature and the lack of sight distance for northbound vehicles. As for the right turn into Governor Prence Road, there is no problem at the south intersection. At the north intersection, right turns become a problem, again because of the lack of sight distance and the lack of any deceleration lane at the intersection. A right turning vehicle here must practically come to a stop because of the full 90 degree angle of the side road and risks a rear end collision when slowing down on Route 6.

Complicating the problem of sight distance is the narrow width of Route 6 in this area. There are four ten foot travel lanes and a range of shoulder widths from zero to eight feet. At some locations there is granite curb on both sides which means no shoulder at all; in some areas there is a raised three foot planting strip and in some places an eight foot grass shoulder. In this latter situation, the shoulder is dotted with utility and sign posts.

Adding to the problem is the Eastham information booth driveways, one at about 50 feet north of the intersection and a second one at about 175 feet from the intersection. These driveways are in a somewhat better position than the Governor Prence Road intersection since visibility for an exiting vehicle in either direction is better. For left hand traffic turning into the parking area, however, the situation is just as bad as for Governor Prence

Road traffic.

Traffic speeds along this section of Route 6 often equal the speed limit of 50 mph. Since this intersection lies almost midway along a comparatively open section of Route 6 between the Eastham-Orleans rotary and Eastham town hall, any design proposals must recognize that the high rate of speed along this stretch will continue.

Recommendations

A signal installation would require the construction of a left turn lane for southbound traffic so that vehicles waiting to turn left would not obstruct through southbound traffic. If a signal is put in at the present location without a left turn lane, the left turn hazard will not be eliminated. Installation of traffic signals is simple. Finding sufficient room for redesigning the intersection to provide for the necessary left turn movement, however, is more of a problem. This problem must be resolved before the issue of traffic signals can be faced.

The question of traffic signals revolves around whether the accident potential from left turning traffic is more or less than the accident potential resulting from imposing a traffic signal on a traffic volume of 20,000+ vehicles per day moving at 40-50 mph.

If a separate left turn lane is provided, this would reduce some of the left turn hazard by removing the threat of a rear end collision. Stored left turn vehicles could wait for a break in oncoming traffic without concern for traffic coming up from the rear.

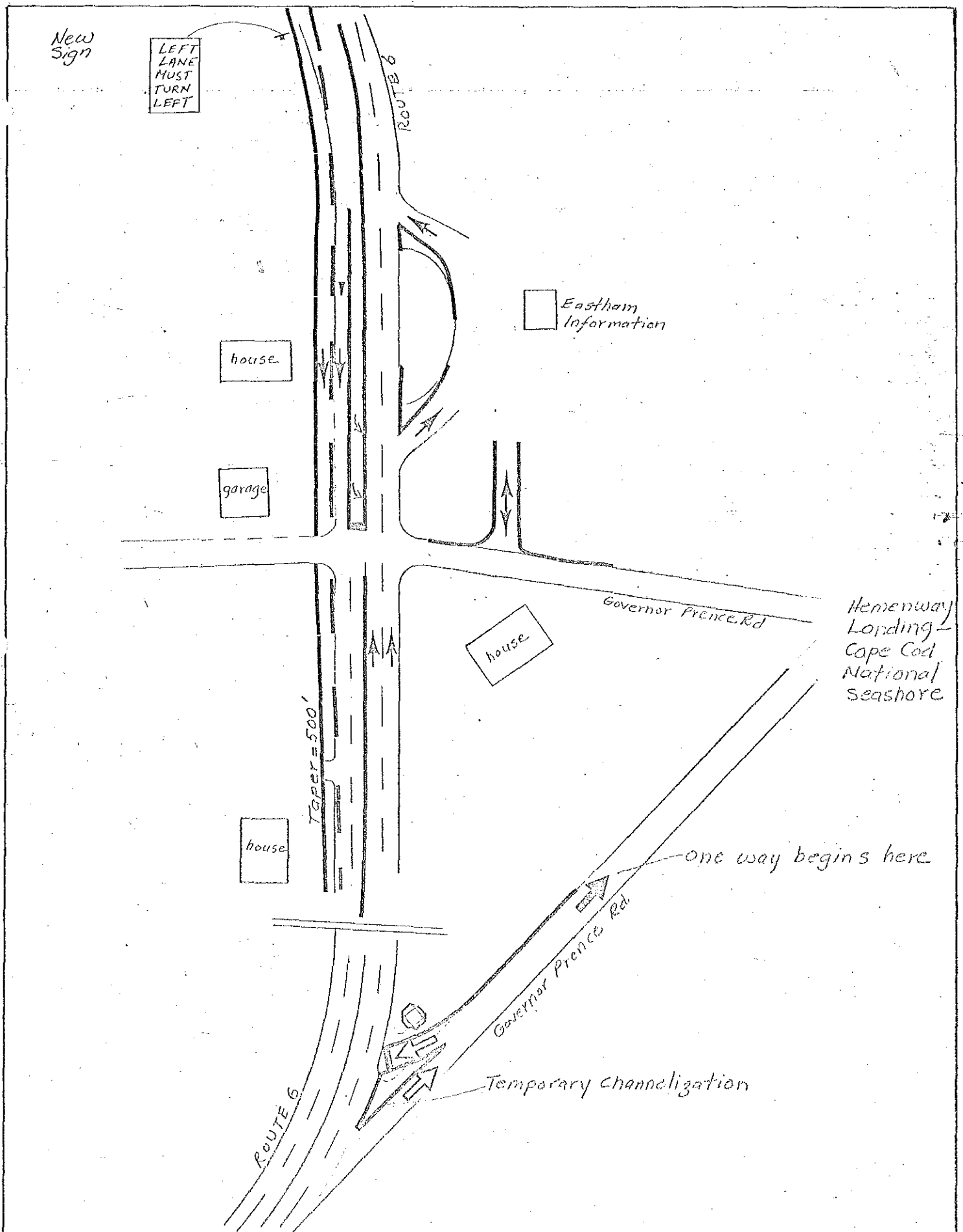
For traffic leaving Governor Prentice Road turning south on Route 6, there is no easy way. Anything short of a traffic light is potentially hazardous.

The north intersection has insufficient sight distance to the south. At the south intersection, while sight distance is less of a problem, the shallow angle of approach as well as the grade, make this movement somewhat less than ideal.

On a short-range basis, it is recommended that the site be marked so that vehicles exiting to the south would use the south intersection appropriately marked by pavement markings and a STOP sign. The next step should be the provision of a left turn lane for southbound traffic making a left turn into Governor Prence Road at the information center. The pavement limits are shown in the sketch and take into consideration existing structures. Two structures might have to be torn down or moved; one is a garage and the other one is (or was) for sale. The house south of Governor Prence Road could also remain although the owners should be offered the option of selling or moving their home. At the same time, through traffic lanes within the area have been widened to at least eleven feet, so that at the intersection, pavement width including the left turn lane is a minimum of 55 feet.

The intersection design should be combined with the information booth driveway to eliminate additional conflicts in the area and to make the entire intersection safer and more efficient. This should pose no problem to the information booth.

Finally, as a last step, an actuated traffic signal should be installed with actuation by either left turning traffic or entering traffic from either direction on Governor Prence Road. The south intersection of Governor Prence Road could then be made a one way into the site and this would eliminate any conflicts here. By using a long cycle length, and scheduling changes in the signal only upon demand, this should reduce the number of times through traffic on Route 6 is required to stop. This will not only maintain a higher level of capacity but also poses less of a threat of rear end collisions.



Route 6 and Governor Prentice Road, Eastham

Figure 8

ORLEANS

Route 6A and Eldridge Park Way

General Discussion

This intersection was chosen because of the occasional congestion which occurs. It is a signalized intersection located less than 1,000 feet from an interchange with Route 6 which, in part, causes some of the problem here. Based on four hour counts, Route 6A has a summer daily traffic volume of 14,500 vehicles per day. This is more than the normal capacity of a two lane two-way road. With the traffic signal thrown in, thus reducing the amount of time available to the major flow of traffic, the capacity of Route 6A is even lower.

Route 6A in Orleans is used strictly for local access, since the entire town can be easily by-passed on Route 6. However, Orleans contains the greatest concentration of commercial development on the Lower Cape which partially accounts for the heavy traffic volumes on 6A.

Eldridge Park Way is a short cut to Nauset Beach and provides direct access to a number of community facilities in Orleans including the high school, town hall and fire and police station. This is a shorter route to most of the eastern part of Orleans and avoids the stop and go traffic found in the center, especially during the summer. Similarly, West Road is a short cut to the western part of town, including Skaket Beach and Rock Harbor. It offers a better way of getting into the downtown shopping area west of 6A.

There is a greater use of both West Road and Eldridge Park Way by permanent and long-term summer residents than by short-term residents and tourists. For the latter, destinations in Orleans are usually reached by 6A and road connections in the center of town.

The intersection is comparatively free from commercial development and other traffic generators although there are some driveways nearby.

Problems

The major problem with the intersection lies in the lack of capacity and a traffic signal control that is not flexible enough to provide maximum efficiency. Part of the capacity problem is due to insufficient turn storage. Northbound on 6A, 25 percent of the traffic flow turns at this intersection. Side road turning movements are 65 percent for West Road and 80 percent for Eldridge Park Way.

In regard to left turn storage, the tightness of the intersection on both Route 6A and side road approaches often makes it difficult for through and right turning traffic to get around vehicles waiting for a left turn. For traffic out of Eldridge Park Way, the situation is made worse by the slight offset of West Road. This makes it difficult for traffic to by-pass cars waiting to make a left turn south onto 6A. Because of the increasing importance of the side roads to local traffic there is a considerable volume of turning traffic although through 6A traffic predominates.

A second problem is that the traffic signal cycle is not flexible enough to efficiently accommodate varying traffic volumes. Oftentimes the green phase for 6A traffic is longer than is needed. When this occurs, it is not unusual for cross traffic to enter onto 6A even though the light is still red. This type of illegal activity is generally an indication that the control device is not performing its function properly.

Raised curbs and the absence of shoulders further lends to the apparent narrowness of the approach roads. The traffic signal layout itself is below

standards recommended by the American Association of State Highway Officials. This situation should be corrected if any new traffic signal improvements are made to the intersection. The standards relate to the location of lights intended to improve visibility.

The Orleans information booth located at the northwest corner is well situated for serving incoming traffic; however, the driveway should be redesigned to reduce traffic conflicts.

Recommendations

In the northbound direction, Route 6A at the intersection should be widened to two lanes. The additional lane should not be marked specifically for a left turn, however. The net effect of the additional lane would be simply to increase intersection capacity.

The West Road intersection should be moved slightly to the north so that it is directly opposite Eldridge Park Road. Both of these cross streets do not have to be widened since their traffic volumes can be handled by a single approach lane. Widening of Route 6A and moving West Road should allow enough room for left turning vehicles to get out of the way of straight through or right turning traffic from Eldridge Park Way.

In connection with signal location, the intersection hardware should be relocated to provide a more standard and, in effect, a safer location for signal heads. In conjunction with this, the island in the throat of the Eldridge Park Road approach should be removed since its only real function here is to protect a traffic signal post. The intersection outlines are reasonably compact, meaning there is no excess pavement at the intersection.

The Orleans information booth access should be improved so that the part of the lot near the intersection is curbed. In view of the small size of the lot, it would be desirable to have merely one driveway opening on Route 6A and a second driveway opening on Eldridge Park Road. Combined with the traffic signal, this arrangement would provide a very convenient and safe way to handle traffic. Internal circulation would not have to be affected since traffic could enter and leave from either direction.

TIME PERIOD
 From 1pm
 To 5pm

VEHICLE VOLUME
 SUMMARY SHEET

Date WEDNESDAY JULY 16, 1970
 Weather WARM

LOCATION RT. 6A and ELDRIDGE PARK RD. ORLEANS

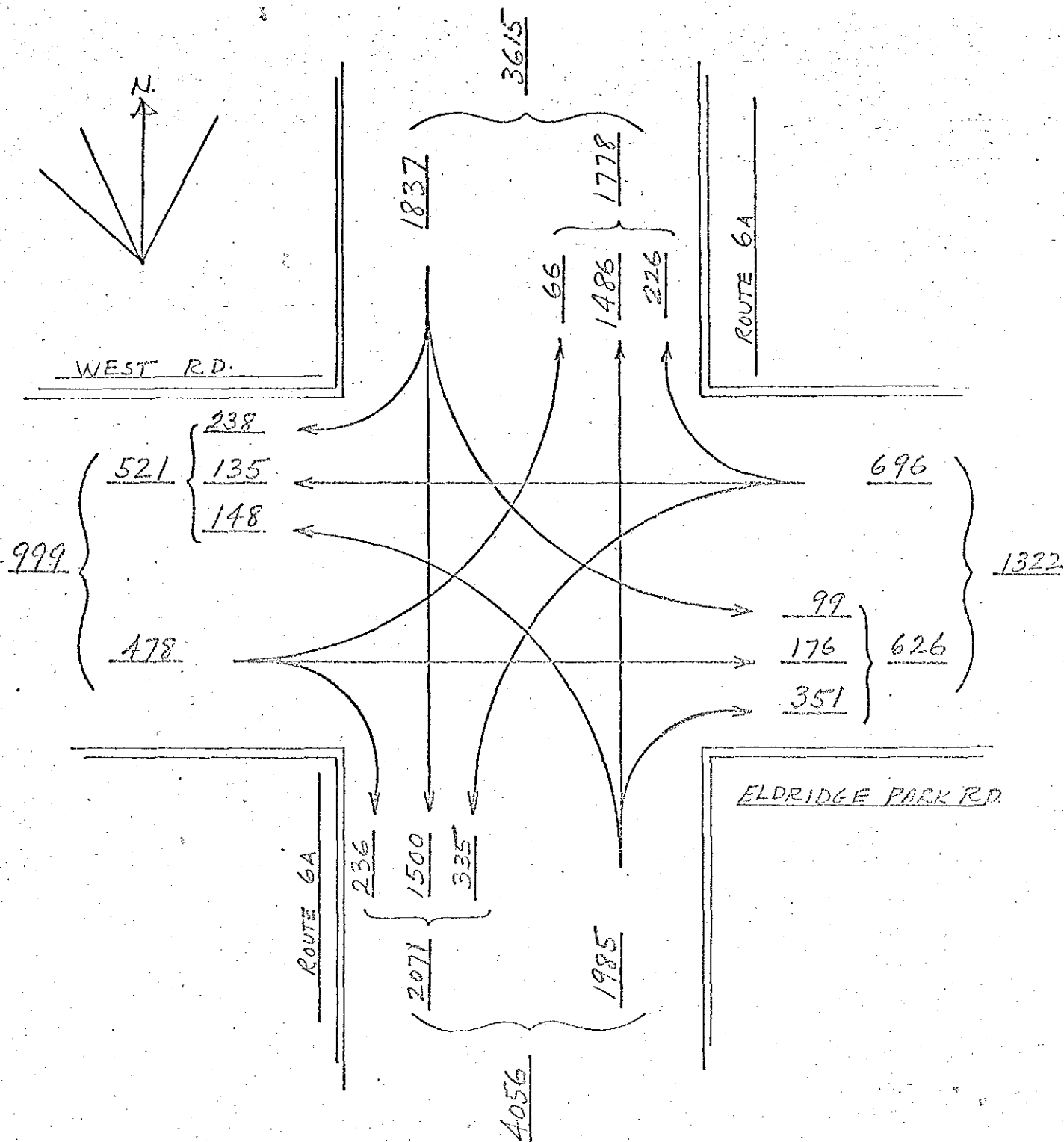
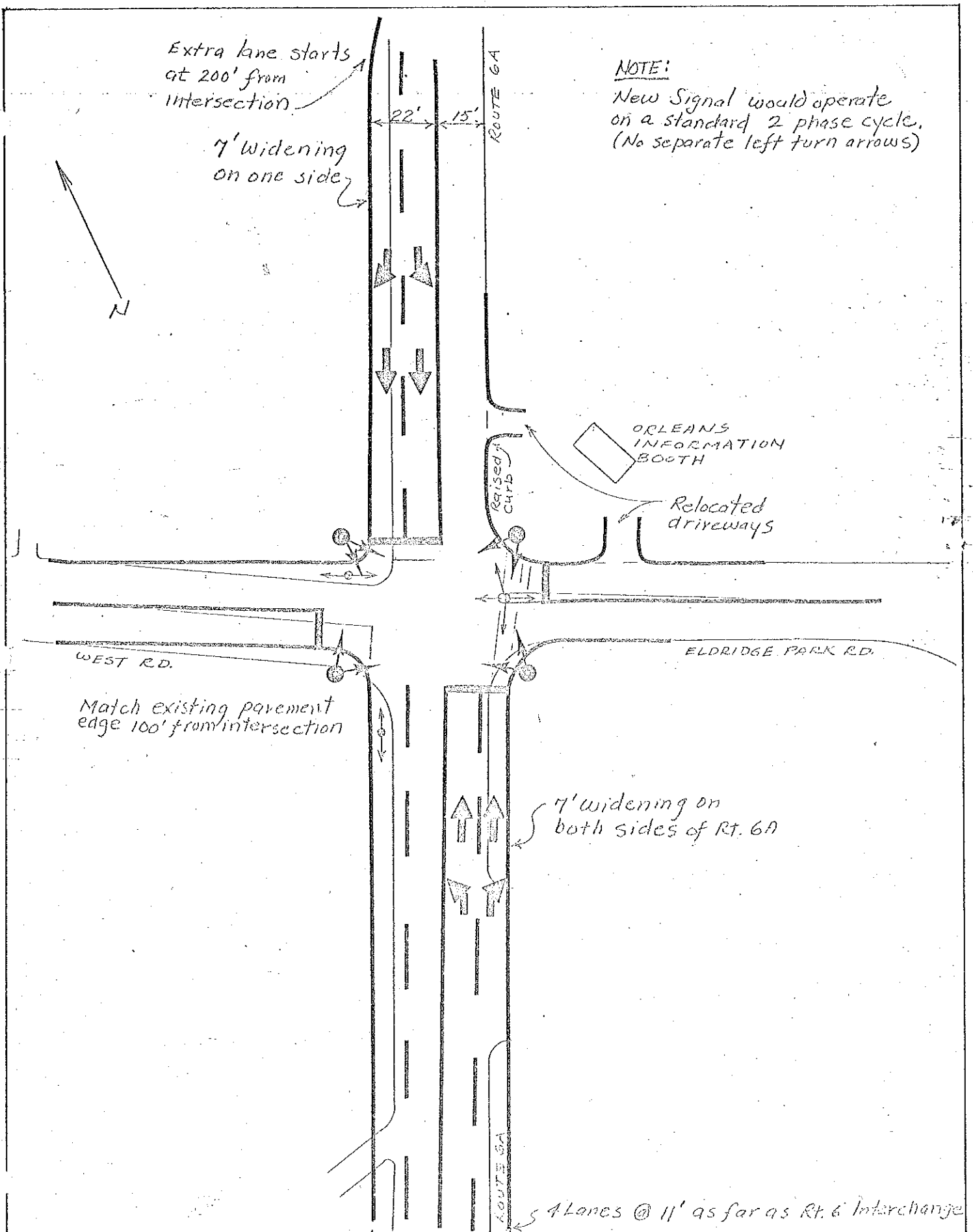


Figure 9



Route 6A and Eldridge Park Road, Orleans

Figure 10

CHATHAM

Route 28 and Barn Hill Road

General Discussion

Traffic operations at this intersection have gotten worse in recent years as a result of increasing traffic volumes and the indiscriminate construction of driveways to abutting property without regard for traffic operations.

While Barn Hill Road serves a limited area, traffic volumes have increased because of increased parking capacity at a major traffic generator -- Harding Beach. Although land uses served by the road have not changed, their intensity has increased which has caused a direct increase in traffic volumes. Route 28 itself has a reputation for being crowded most of the summer, although this section of Route 28 is considerably less congested than in Yarmouth and Harwich. Much of the traffic volumes and the numerous delays are caused by extensive strip development with virtually no control of access. This situation gives rise to erratic traffic movements on Route 28. Improved access control would not reduce traffic volumes or traffic generation of abutting businesses, but would certainly improve traffic operations, including travel speed. This intersection area represents just one more obstacle for traffic on Route 28. For traffic on Barn Hill Road, it represents a challenge, particularly for those making a left turn westbound. (See Figure 11)

Problems

The most serious problem affecting this intersection is the blockage of Route 28, westbound, by vehicles turning left into Barn Hill Road or the shopping center located on the west side of the intersection. At the intersection itself, a left turning vehicle can be by-passed, using the shoulder. This maneuver is very much in evidence judging from the worn

shoulder on the north side of Route 28 at the intersection. Traffic turning into the shopping center at the east driveway, however, causes a more serious problem. A stored left turn vehicle blocks the westbound roadway. Furthermore, the situation is more complicated by cars making a left turn out of Barn Hill Road onto Route 28. Often the left turn is blocked by traffic waiting to get into the shopping center which in turn blocks Route 28 and finally, Barn Hill Road.

Because of the narrow width of Barn Hill Road, traffic waiting to make a left turn frequently blocks right turning traffic which could proceed more easily onto Route 28. The small channelization island at the throat of the intersection forces left turning traffic to the right thereby blocking the right turn movement. A commercial building and foundation plantings are right on top of the approach roadway which further prevents a right turn lane from forming.

Visibility is good, both on Route 28 and on Barn Hill Road waiting to enter Route 28. The only visibility problem is that traffic headed east on Route 28 cannot easily see traffic waiting to enter at Barn Hill Road because of shrubbery planted right up against the right-of-way and pavement.

Recommendations

Traffic volumes at this intersection justify the installation of a traffic signal control. The summertime traffic volumes meet the state's "minimum vehicular volume warrant" and "interruption of continuous traffic warrant". Even if the intersection operated at 50 percent of summertime volumes, traffic signals could still be justified on the basis of interruption of continuous traffic. Because of the wide fluctuation between summer and winter traffic volumes, a signal should be of the semi-actuated type. It is possible that intermediate improvements may relieve the traffic problem here with a minimum of cost and inconvenience.

As a first step, Route 28 for a distance of approximately 500 feet should be widened one additional lane in the westbound direction so that left turning traffic into Barn Hill Road and the shopping center will not block traffic. Figure 12 shows how this lane would be added.

Route 28 at this intersection has a slight curve in it which would make a widening on the north side of the road very easy to accomplish. Only some utility poles and one or two small trees are in the way. A larger tree could remain, however, it would probably have to be protected with a small section of guard rail. This is not a high speed solution but reflects the rather slow speeds found on Route 28 in this area.

A second major improvement to the intersection would be the closure of the east driveway (on Route 28) to the shopping center. No alternative is needed since the west driveway can adequately serve this small shopping area. The driveway opening onto Barn Hill Road should be redesigned so that its width is reduced from 95 feet at present to a more reasonable 24 feet. The remaining opening should be as far south as possible to prevent interference with intersection operations. Changes in driveway design should not present any problem to either the owners or the users except a change in their access and egress patterns.

The Barn Hill Road approach should be modified so that the throat of the intersection is two lanes wide for a distance of about 50-75 feet. This can be done by removing the island which is in an awkward location. More definitive access control at the restaurant directly across the street from the shopping center would improve the appearance of the intersection although it would probably not materially improve operations.

Should a traffic signal be installed here in the future, these proposed design changes would fit in very nicely with any new scheme that is proposed. It is unlikely that the DPW would install a traffic signal at this intersection without substantial reconstruction that would involve greater restrictions than proposed in this report.

TIME PERIOD
 From 1pm
 To 5pm

VEHICLE VOLUME
 SUMMARY SHEET

Date JULY 9, 1970
 Weather HAZY-WARM

LOCATION ROUTE 28 and BARN HILL ROAD, CHATHAM

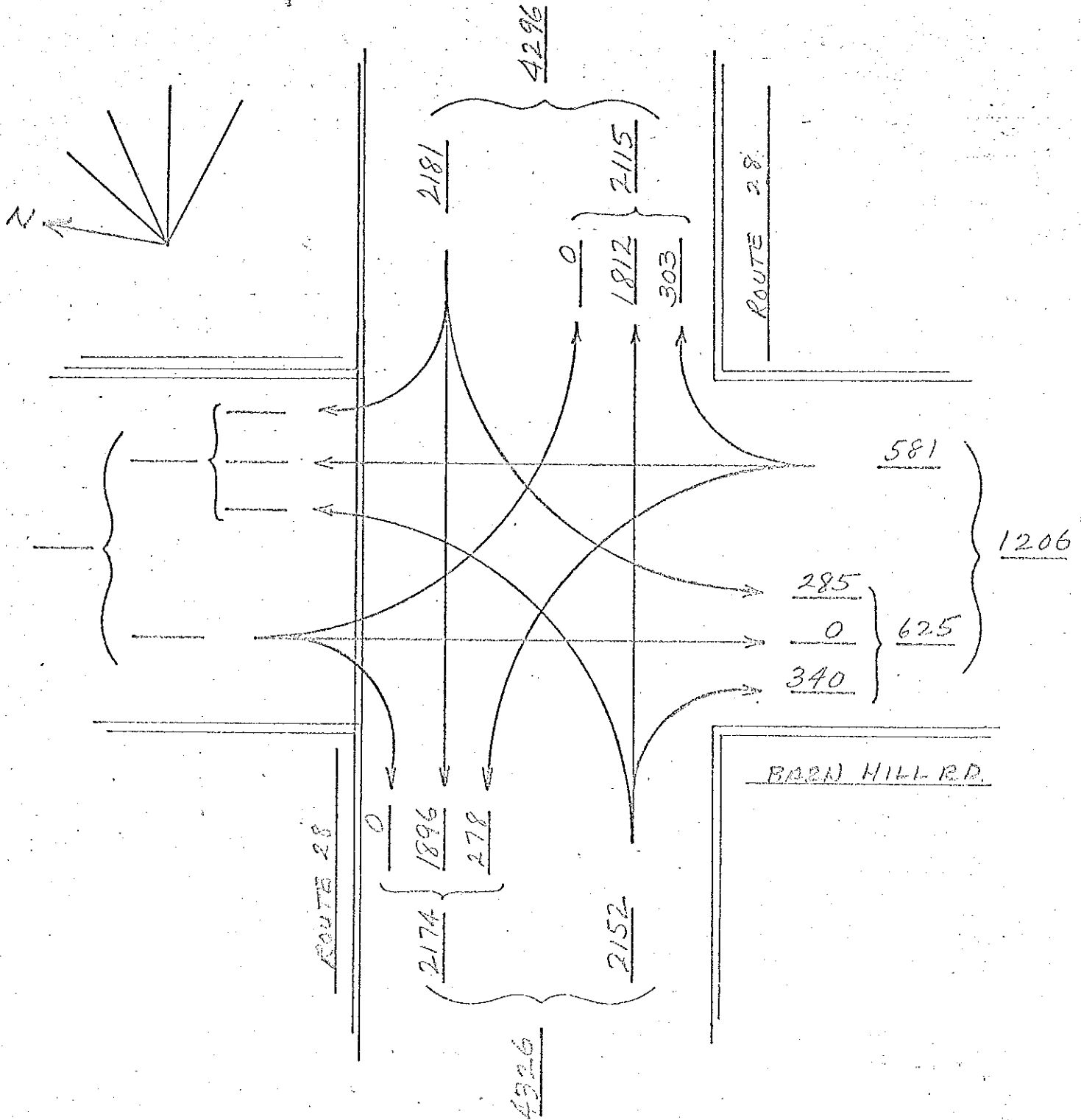
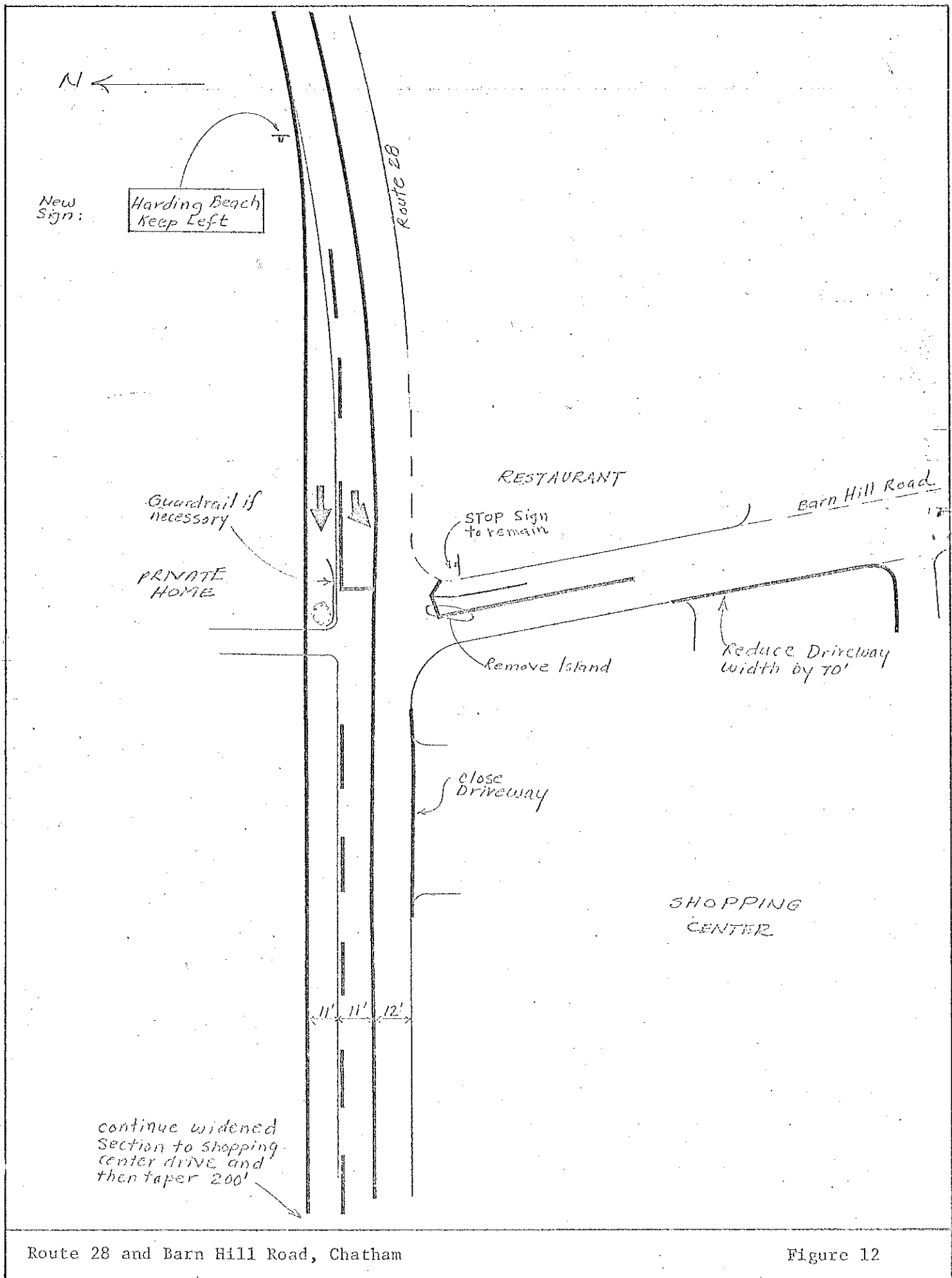


Figure 11



Route 28 and Barn Hill Road, Chatham

Figure 12

BREWSTER

Route 124 and Route 137

General Discussion

Brewster, because of its location and lack of major traffic generators, is mostly free of serious traffic congestion. This intersection of two major arterial roads which connect Brewster to the built-up portions of Harwich and Chatham as well as to Route 6 was chosen because of the accident experience over the past few years. Traffic volumes are low even during the summer, well below the capacity of the approach roadways. (See Figure 13.) Traffic signals are not warranted at this location based on traffic volumes even during the summer months. The intersection area is free of disruptive elements such as wide driveways, numerous commercial signs or parking areas.

Problems

Because of the deceptive simplicity of this nearly 90 degree intersection, the location has apparently become a forgotten one. This may be one reason why traffic control measures have been somewhat carelessly applied. For example, the yellow flasher which faces Route 124 traffic in both directions, was recently replaced following its destruction in an accident. In replacing this flasher, the post length was increased raising the signal head which reduced visibility of the flasher for southbound traffic. Low-hanging branches which are covered with leaves during the summer cause the reduction in visibility. While current visibility is still within acceptable sight distance limits, a much longer sight distance could be provided by installing a shorter post.

Another example of the improper maintenance given to this intersection is the red flashers facing Route 137 traffic. At the time of the field survey, the lenses in both directions were broken and the light source was a 25-watt bulb, quite inadequate, especially considering the safety problems this intersection has had. Lack of maintenance extends to the more critical signs and markings at this intersection, namely the STOP and STOP AHEAD signs. Stop lines painted on the pavement have also been sorely neglected. Both STOP signs are in poor condition, one STOP AHEAD sign is in poor condition and both stop lines are obscure. Their positioning in relation to the intersection itself is satisfactory, although there is a problem with the location of the stop lines: when a car is stopped in the appropriate place in either direction on Route 137, it is difficult to see the approaching traffic on Route 124. This means that traffic must edge out into cross traffic before proceeding.

Route markings at the intersection are clear, well-maintained and located. A 24 inch crossroads warning sign northbound on Route 124, however, is in poor condition; there is no crossroads warning sign for traffic headed southbound.

Another problem at the intersection is the heavy growth of vegetation on all approaches to the intersection. This reduces visibility and makes stopped traffic difficult to see by on-coming vehicles and vice versa. It is unrealistic to propose a visibility situation where cross traffic can be seen from all directions; however, some improved visibility at the intersection is desirable.

Recommendations

In view of the poor accident record of this intersection a traffic signal appears necessary. There are no obvious roadway elements which constitute a hazard, except possibly the lack of visibility between opposing traffic. A signal would provide the type of positive traffic control that would hopefully eliminate severe collisions. Although new traffic signal installations have a

tendency to increase minor rear end collisions, the low traffic volumes encountered here create very little exposure to this type of accident. At the present time, the Mass. DPW has placed this intersection high up on the list to receive a traffic signal. Because of the light volumes, a fully actuated installation has been proposed.

Until signals are installed, some work is needed immediately. The first step would be to replace both 30 inch STOP signs with 36 inch panels. The 24 inch STOP AHEAD sign in the westbound direction on Route 137 should be replaced by a new 30 inch panel and moved about 100 feet further away from the intersection. A solid white 12 inch stop line should be painted on both Route 137 approaches using permanent type reflective material. These stop lines should be relocated forward of the existing stop lines so that stopped drivers can see approaching traffic before starting up again. Figure 14 shows proposed immediate improvements.

The 24 inch crossroads sign on Route 137 eastbound should be removed. This type of sign should not be sandwiched in between a STOP AHEAD and a STOP sign. It is not normally associated with a stop situation.

On both Route 124 approaches there should be a 24 inch crossroads warning sign with an advisory speed plate of 30 miles per hour. Only the speed plate need be added to the northbound crossroads sign located 300 feet from the intersection. Southbound, an entirely new installation is required at about 300 feet from the intersection.

To make the intersection more visible at night, at least one more luminaire should be added. Within the intersection area itself, pruning of some underbrush without removing important vegetation would improve the visibility in

the immediate vicinity. The purpose of this is to allow as much sight distance as possible for approaching vehicles whether or not they are required to stop. It would permit drivers approaching on Route 124 to spot cross traffic sooner than it now can. Even with a traffic signal installed here, the brush clearing would improve operations.

The basic reasons for these improvements is to alert the through driver on Route 124 that he is approaching an important intersection and that he is required to slow down. On Route 137, the proposed changes are aimed at alerting approaching drivers that they must come to a complete stop at the intersection. At the present time, the necessary control devices needed to do this either do not exist or are inadequately maintained.

TIME PERIOD
From 1pm
To 5pm

VEHICLE VOLUME
SUMMARY SHEET

Date MONDAY JULY 13, 1970
Weather WARM

LOCATION ROUTE 137 and ROUTE 124, BREWSTER

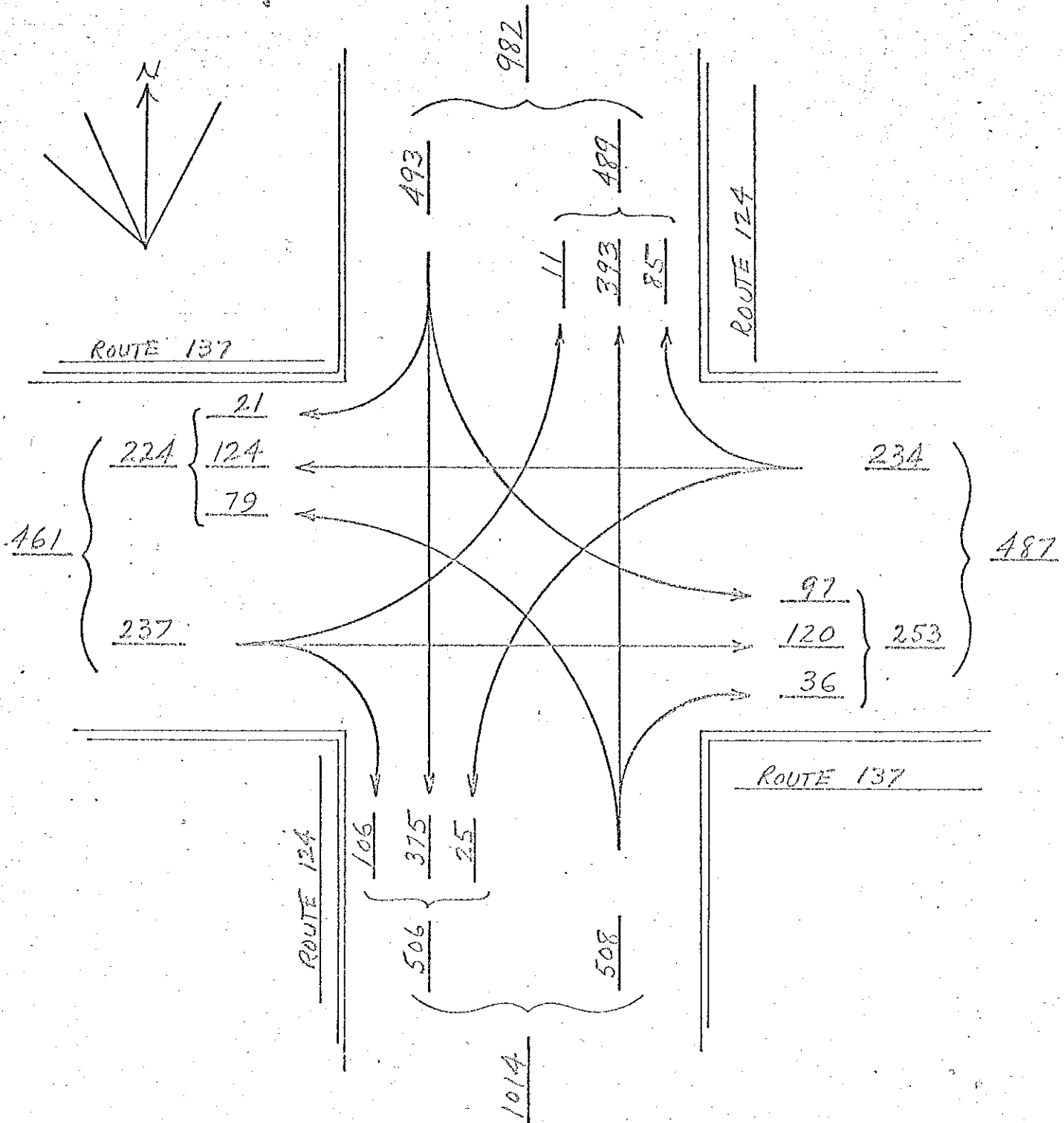
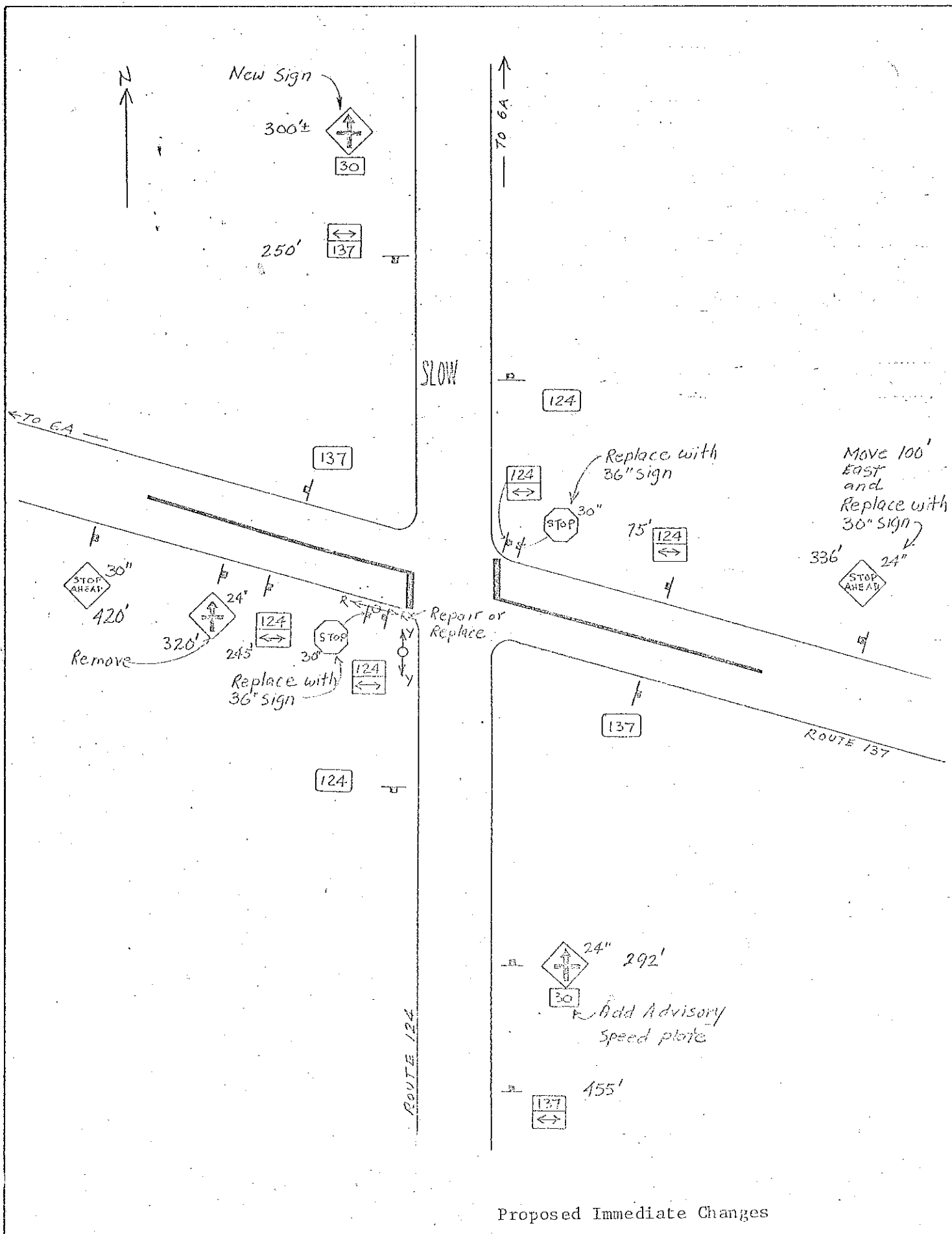


Figure 13



Route 137 and Route 124, Brewster

Figure 14

HARWICH

Route 137 and Route 39

General Discussion

This intersection of Route 137 (Long Pond Road) and Route 39 (Orleans-Harwich Road) was chosen as an example of how to treat an intersection before it becomes a problem. The emphasis in this section of the report is to point out the type of controls for land use and traffic that can be used to prevent the occurrence of congestion and traffic safety hazards.

Route 137 is an important route serving a large part of the "elbow" area of Cape Cod including all of Chatham and the eastern part of Harwich. Route 39 is an important arterial connecting Harwich and Orleans. It is used during the peak traffic periods by knowledgeable full- and part-time residents who are aware that a high operating speed can be maintained along the entire route which parallels Route 6. Further affecting the roads in this area has been the development in recent years of numerous subdivisions catering to permanent residents moving to Cape Cod.

Because of high operating speeds in the range of 40-50 miles per hour and moderate volumes on all four approaches to this intersection, positive control in the form of STOP signs has been instituted. These have been augmented by flashing lights because the intersection is hard to see by approaching traffic from all directions. Route 39 traffic is stopped while Route 137 is given the right-of-way. This is the correct arrangement since Route 137 has more traffic.

The State Department of Public Works acquired property several years ago on all four corners of this intersection with the intent of eventually construc-

ting a rotary to eliminate the right-angle conflicts which now occur. Since that purchase, however, the rotary as a method for controlling traffic at right-angle intersections has been discontinued because of its lack of capacity. A traffic light controlled right-angle intersection has greater capacity than a rotary especially if most of the approaching traffic is through traffic -- a situation which clearly exists at this intersection. (See Figure 15.)

Thought has been given in recent years to the possibility of requesting that the land be returned to its original owners since it will probably not be used for a traffic rotary. Although town officials in Harwich have indicated that this course of action would be desirable, they do not wish to return all of the land to private ownership only to find that an opportunity to retain the intersection's high capacity potential has been lost. Accordingly, this section makes recommendations as to the disposition of property and the development of land in the vicinity of this intersection.

Problems

Aside from the basic conflicts which occur at a right-angle intersection, there are a few problems associated with this intersection. Advance warning signs on Route 39 are in poor shape and should be replaced by new signs. Because of the openness of the road approaching the intersection, motorists are often unprepared for a full stop situation. The intersection is hard to identify by motorists approaching on Route 137, so they are not fully prepared for a situation which may involve crossing vehicles or turns. A standard 30 inch side road sign should be placed on both approaches on Route 137 with an advisory speed plate calling for a speed limit of 40 miles per hour.

Recommendations

There is no objection to returning most of the land originally acquired by the DPW to private ownership; however, certain limitations should be made in this regard. The town should retain a strip of land on both sides of all four approaches to prevent future driveways from being located on the immediate approaches to the intersection. The DPW ownership extends for a distance of approximately 300 feet in all four directions from the intersection. (See Figure 16.) Any development at the corner should be served by driveways located at least this distance from the intersection.

The strip of land that is retained in public ownership should be sufficiently wide to permit widening of the intersection approach roadways to four lanes. A 100 foot right-of-way should be kept for about 300 feet in all four directions with access control for another 100 feet. This would still allow access to all existing parcels of land. The town should prevent subdivision of land in this area aimed at circumventing intended access control.

The additional lanes and median will handle increased traffic volumes and also an increase in turning movements as land in this area is developed.

Because of the closeness of this intersection to Route 6 and its accessibility from Chatham, Harwich and Brewster, the possibility of commercial development exists. If land in this area is to be zoned for commercial purposes, it is suggested that the south quadrant be initially designated for this purpose. Located in this way, traffic from Route 6 headed into Chatham would find it easy to use the commercial area without adding to intersection turning movements. Traffic coming from built-up portions of Harwich or Chatham would not have to go through the intersection. In observing existing commercial and residential patterns in this part of the Cape, it is quite likely that these are the areas that

would represent the primary trading area for any new commercial development here. Conversely, traffic generated in the north quadrant would create the highest level of intersection traffic. Town owned land in this location effectively reduces the possibility of this quadrant becoming developed for commercial use.

On a long-term basis, the Massachusetts DPW probably no longer has a use for the land it originally acquired for a rotary and it would be appropriate for the town to request its return either to the town or to original owners. In making this transfer, however, the town or the DPW should retain sufficient land on the approaches to the intersection to permit future widenings for turning lanes, a median, and to control the construction of driveways on the immediate approaches to the intersection.

There are a few improvements which could be made to the existing intersection. Westbound on Route 39, warning signs are in poor condition. A "Road Left" sign is in poor condition and is located too close to the intersection. A more important sign, the crossroads warning sign for Route 137, is missing. This one is especially needed because the road intersection is partially hidden by a slight rise on Route 39.

TIME PERIOD
From 1pm
To 5pm

VEHICLE VOLUME
SUMMARY SHEET

Date MONDAY JULY 13, 1970
Weather SUNNY

LOCATION ROUTE 137 and 39, HARWICH

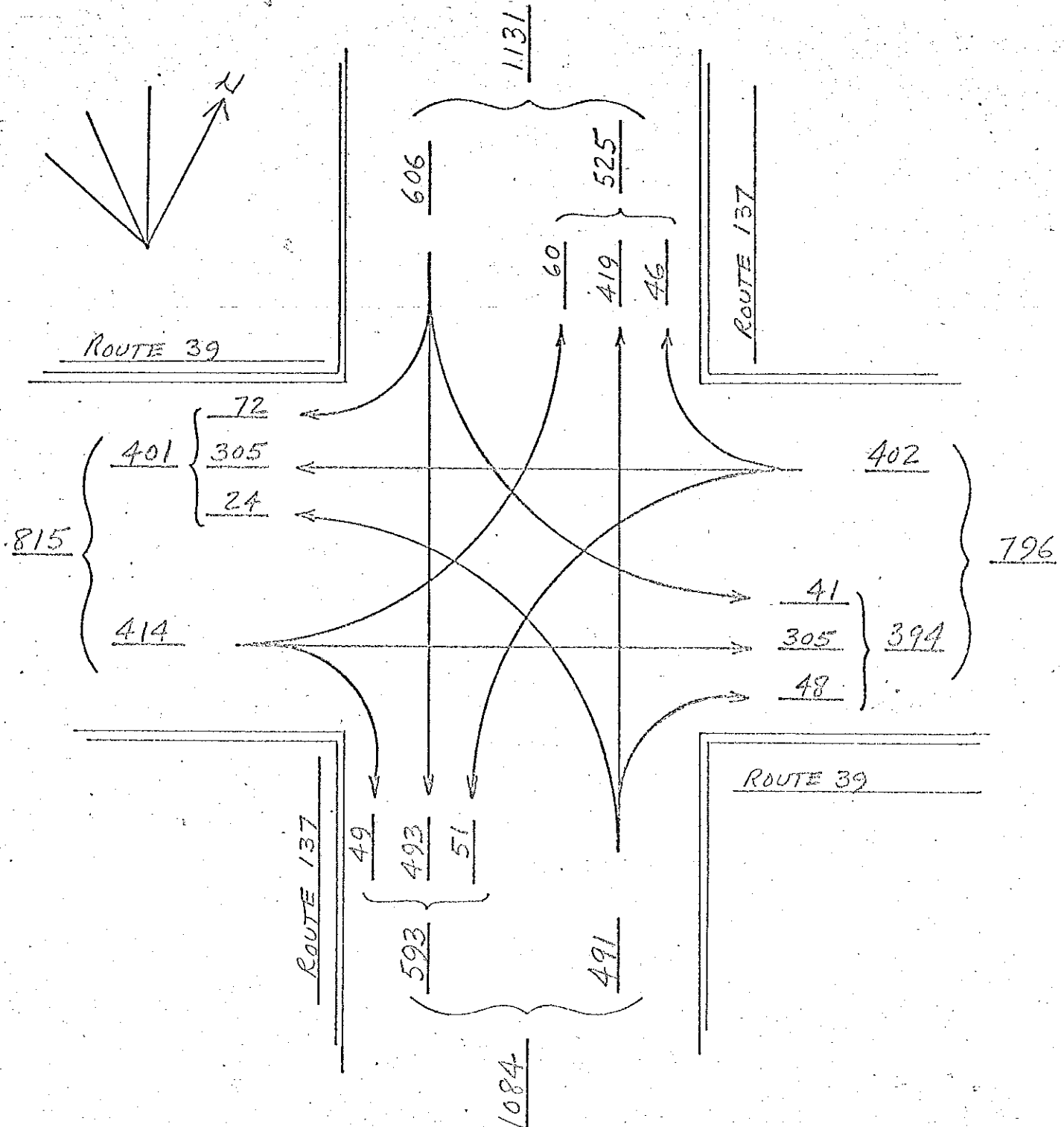
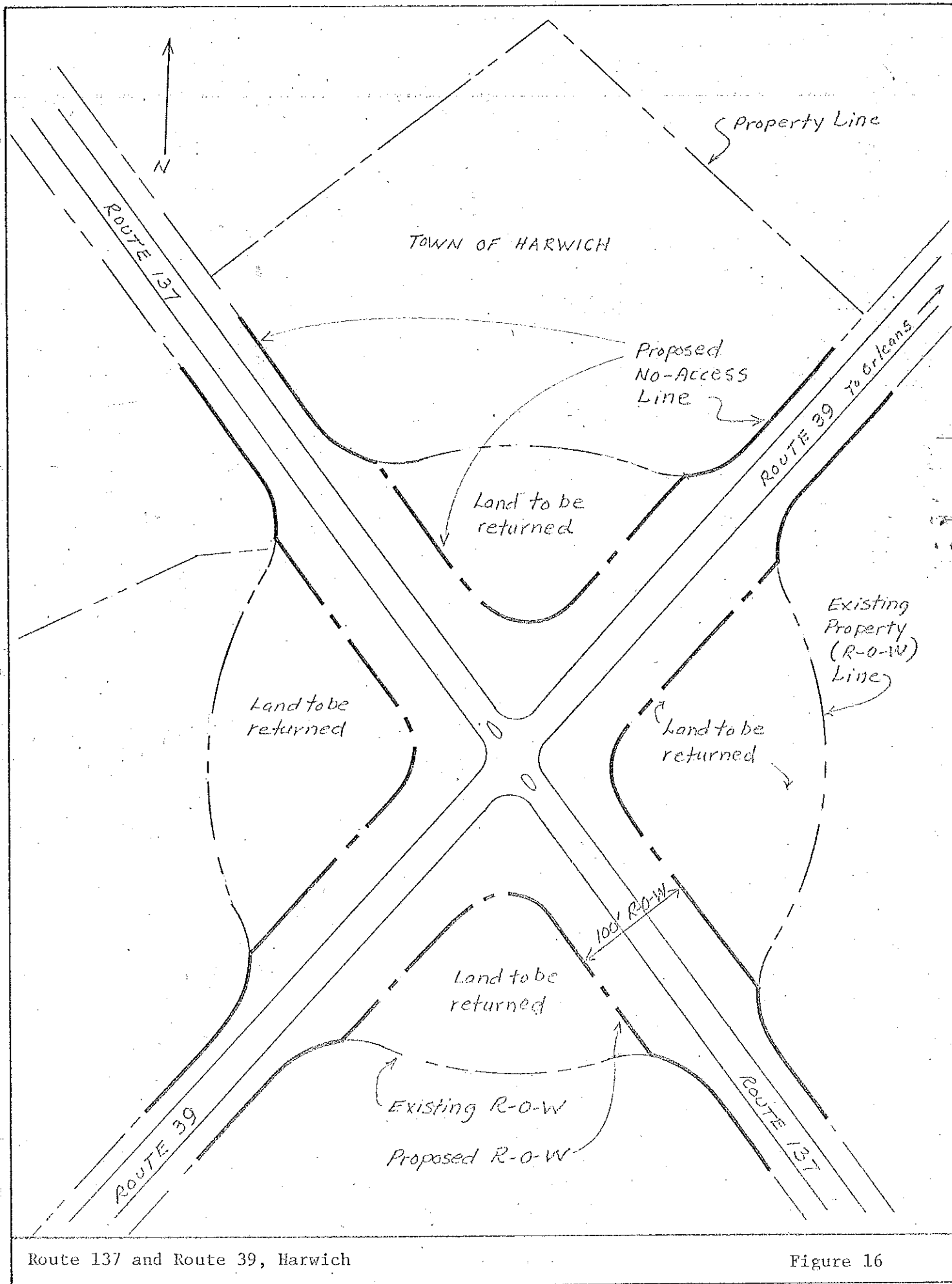


Figure 15



Route 137 and Route 39, Harwich

Figure 16

DENNIS

Route 28 and School Street

General Discussion

This intersection is located on Route 28 at a sharp transition between a small town main street and "Route 28 Cape Cod" development. The main street section is composed of a four lane road, two lanes devoted to parallel curb parking and two lanes devoted to moving traffic. East of the intersection, the road reverts to two lanes with narrow or no shoulders and numerous driveways. Trees and utility poles effectively eliminate a shoulder which in some places has been paved to resemble a sidewalk.

The center of West Dennis is not typical of Route 28 and must come as a surprise to tourists. After several miles of strip development on either side of Dennis, one suddenly discovers a few blocks of stores, curb parking, a sidewalk and a raised granite curb.

School Street, an intersecting road, is not merely a side road serving residential development. It is the main road to a large area of medium density seasonal and year round residences. It is the western terminal connection to Route 28 for Lower County Road which serves the entire south shore of Dennis. There are a number of commercial establishments on School Street; however, most of the traffic is between Lower County Road and Route 28. (See Figure 17.)

Problems

Field observation immediately ascertained the problem at this intersection. A traffic signal is needed. Traffic volume figures confirm this. Comparison with the Massachusetts D.P.W. traffic signal warrants is significant. Under

existing physical conditions, if the total approach volume from both directions is more than 500 vehicles per hour and the minor street approach volume is over 150 vehicles per hour for a period of eight hours or more, a traffic signal is justified. During the four hours of the traffic count, the 500 vehicle volume was exceeded by a factor of two. The minor street volume did not drop to below 150 until after 5 pm. During the summer it is probable that School Street exceeds this figure for over eight hours per day.

The problem here is not so much the traffic movements on Route 28 as it is the left turn out of School Street into Main Street. A second warrant entitled, "Interruption of Continuous Traffic," can be applied. Under this warrant, the major street approach volumes must be at least 750 vehicles for eight hours or more and the minor street approach volume only 75 vehicles per hour. This warrant was exceeded during the entire four hour counting period from 3 pm. to 7 pm. If the intersection were counted for an entire 24 hour period, the results would show that it meets the requirements for a traffic light.

These traffic signal warrants could be reduced. The manual states that "when the intersection lies within the built-up portion of an isolated community having a population of less than 10,000, the minimum vehicular volume warrant is 70 percent of the requirements." West Dennis would probably meet the requirements. It is possible, based on observations in October, that off-season volumes would also show that a traffic signal could be justified at this location.

Recommendations

There are no major restrictions to traffic flow which, if corrected, would significantly improve traffic operations at this intersection. There are simply too many cars travelling on Route 28 to allow School Street traffic to enter without difficulty. The low traffic speeds (speed limit in this area is 25 mph)

make the situation a little better than would be the case if traffic speeds were high. Therefore, the major recommendation for this intersection is to design and install a traffic signal. To keep the high volumes going, it will be necessary to have two lane approaches in both directions on Main Street and on School Street. A semi-actuated signal which permits Route 28 traffic to flow so long as there is no side street demand should be considered. Meanwhile, police control at the intersection should be provided during high traffic periods.

The gasoline station at the southwest corner of the intersection does not help the situation. It is all open driveway from property line to property line with the pump islands close to the right-of-way. Because of the extremely tight dimensions of the property, access control is impractical. The only way traffic interference from this gas station can be removed is to move the station itself. Changing the land use at the corner, however, will not solve the basic problem.

There are two minor changes which would help traffic operations at the intersection that do not involve major construction. One of these would be to relocate the utility pole at the southeast corner of the intersection and to increase the radius of that corner. Over one third of School Street traffic makes a right turn at this intersection. If the right turn could be made so that vehicles do not have to swing out into the middle of Route 28, it would help to reduce the total back-up of traffic. (See Figure 18.) A second improvement involves a slight widening of Route 28 along the north side of the street so that a full, marked left turn lane for traffic entering School Street from the east can be designated. These are only minor improvements to the intersection. Of all the intersections studied in this report, this intersection ranks number one in terms of meeting traffic signal warrants.

TIME PERIOD
From 3 pm
To 7 pm

VEHICLE VOLUME
SUMMARY SHEET

Date MONDAY JULY 27, 1970
Weather SUNNY

LOCATION ROUTE 28 and SCHOOL ST., DENNIS

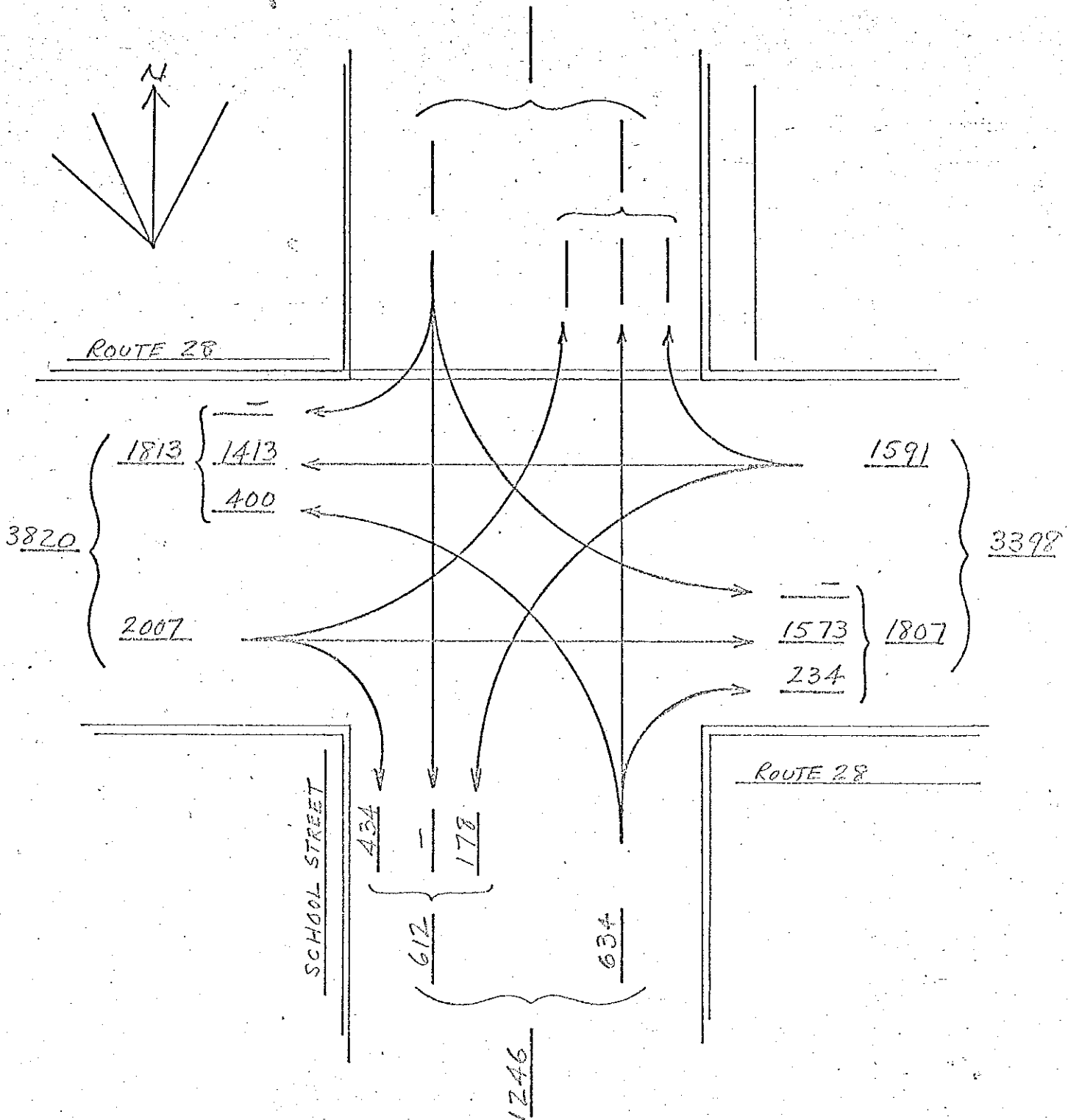
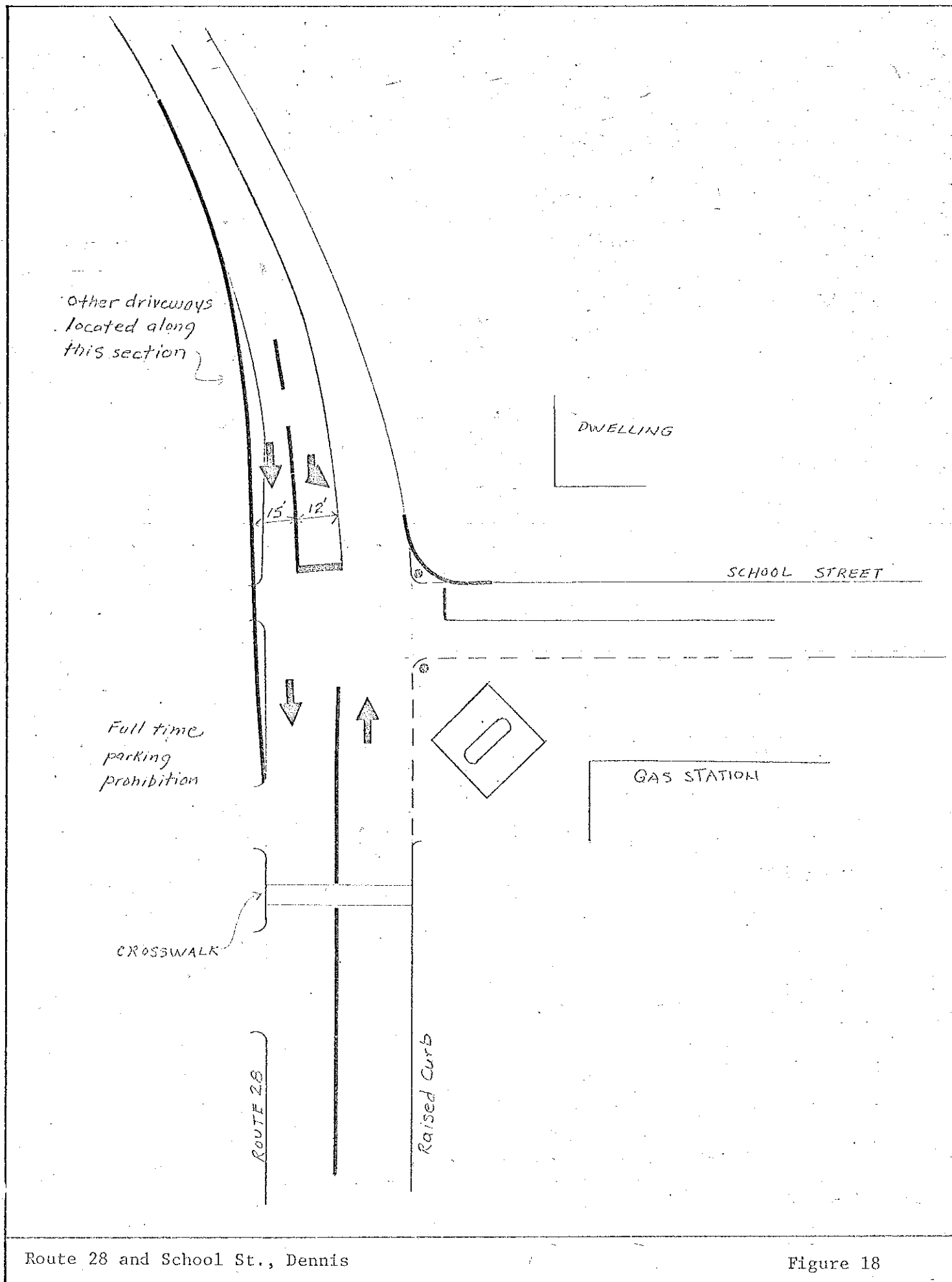


Figure 17



Route 28 and School St., Dennis

Figure 18

Yarmouth

Route 28 and South Sea Avenue

General Discussion

This intersection stands out even on crowded Route 28. In studying this intersection, it was necessary to take into consideration Winslow Grey Road, whose intersection is located only about 250 feet down the road. The traffic signal at this intersection is necessary to permit South Sea Avenue traffic to enter Route 28, especially the heavy left turn movement. Without the traffic light, this movement would be impossible to make whenever traffic is heavy. The lack of access control, which is a problem along all of Route 28 on Cape Cod, composes a significant portion of the problem at this intersection. The gift shop located at the southwest corner of the South Sea Avenue intersection, however, is a good example of how to handle a large, corner traffic generator. For 200 feet on Route 28 and 130 feet on South Sea Avenue, no access to the parking area is allowed. This limits the number of turning possibilities at or near the intersection, and assists greatly in reducing potential congestion and accidents. The Route 28 access has been channelized so that there is a separate entrance and exit driveway. While these controls have no legal status, they nevertheless assist in keeping driveway traffic under control.

The recommendations contained in this section, while of direct benefit to the intersection, would not have a noticeable impact on the overall Route 28 traffic problem. If officials of Yarmouth feel that the recommendations contained in this report have a chance of being carried out, the town should consider an operations study for the entire length of Route 28 in order to improve its efficiency and capacity. While such a study would not reduce the volumes on Route 28, it would reduce the number of times per year that congestion does occur by raising the traffic volume level at which traffic operations become annoying.

Problems

One of the basic problems of this intersection is its lack of intersection capacity. Figures 19 and 20 show traffic volumes during a four hour period. It is estimated that this figure is one quarter of the daily traffic which occurred on the date of the count. Perhaps equally significant are the hourly traffic figures on the intersection approaches. During the counting period, hourly volumes in both directions on Route 28 consistently ran at the 600 vehicles per hour level. This is above the practical capacity of the intersection and implies that congestion was occurring. Traffic volumes on Winslow Grey Road are light and pose no basic problem at the intersection. South Sea Avenue traffic is much heavier. While the traffic volume does not tax the capacity of the two lane roadway itself, the green time required to serve South Sea Avenue traffic reduces Route 28 capacity. The traffic counts show that the right turns represent about 45 percent of South Sea traffic while left turns comprise 55 percent. If two approach lanes could be provided on South Sea Avenue, the same traffic volume could be handled with less green time which could then be used by Route 28.

One major complication at the intersection is the lack of access control. As a result, turns can be made on and off Route 28 at almost any location which adds to the confusion. In particular, the block of stores on the north side of Route 28 now provide right angle parking at the doorstep. Except for a 95 foot strip of land immediately opposite South Sea Avenue, the north side of Route 28 is an open driveway for over 500 feet from Winslow Grey Road to the east. Any improvement in traffic operations at this intersection will require some type of access control for the properties on this side of the street.

Recommendations

The recommendations involve two separate approaches: one is to increase intersection capacity by adding approach lanes on both Route 28 and South Sea Avenue, and the second is to establish some type of access control so that entering and leaving traffic does not interfere with intersection operations.

As a start, the South Sea Avenue approach should be slightly widened to provide two approach lanes for a distance of 100 feet. This will provide separate left and right turn lanes, and should theoretically reduce the amount of green time required for South Sea Avenue traffic by nearly 50 percent. The cycle length should not be changed but the extra green time should merely be added to the Route 28 green phase. South Sea Avenue now had a width at the intersection of 31 feet. Normally, this is sufficient to allow two ten foot approach lanes and one eleven foot departure lane. The utility poles on the east side of the approach effectively limit the width of the pavement. If these utility poles could be moved back to the property line, the roadway could be re-marked to show two approach lanes each having a full effective width. Across the street, the shoulder is paved so that, if necessary, part of it could be used for providing a slightly wider traffic lane. In any case, it is easy to provide the added lane at this location.

At Winslow Grey Road, a stop line and appropriate sign should be erected on Route 28 so that left turning traffic out of Winslow Grey Road has an opportunity to enter Route 28. A stop line painted on the pavement and a "Do Not Block Intersection" sign should be sufficient. Although Winslow Grey Road traffic is not very high, two-thirds of the approaching traffic makes a left turn onto Route 28.

The westbound Route 28 approach pavement should be widened approximately

three feet for a distance of 100 feet to give a total pavement width of 35 feet. The eastbound roadway should continue with a width of 15 feet; however, the westbound roadway should be allowed 20 feet so that left turning traffic can store at the center line without blocking through traffic. It is ironic that at the present time, the left turn occurs opposite an isolated section of shoulder. If this obstruction were not there, through traffic would infringe upon abutting property to by-pass waiting vehicles. See Figure 21 for proposed changes.

No changes are recommended for the eastbound approach. The right turn into South Sea Avenue from Route 28 is not large enough to warrant a separate lane.

As for access control, it is recommended that the north side of Route 28 from South Sea Avenue to Winslow Grey Road be made "no access." This would involve the construction of some type of barrier along the right-of-way either by the town or by the property owners. Parking in front of the stores could be retained by using 60 degree angle parking. This would reduce the parking supply immediately in front of the stores by about 20 percent. The proposed change involves a one way pattern in front of the stores with traffic entering on Route 28 and leaving on Winslow Grey Road. People that do not want to do this could use the parking area east of the stores and, presumably, could leave the same way they came in. It would be very easy for all the stores on Route 28 to get together and provide parking in the rear. They all have the same problem, the 90 degree parking in the front isn't convenient and interferes with Route 28 traffic.

A solution which involves considerably more dislocation would make Route 28 four lanes wide between Winslow Grey Road and a point about 500 feet to the east. This would permit a two lane approach in both directions which would greatly increase intersection capacity. Such a widening should

be made on the north side of the street. This would require the development of a new parking area behind the stores and a partial re-orientation of the stores toward the rear. Not all of the land between the existing road and the stores would be utilized for the pavement, there would still be about 35 feet between the stores and the roadway which could be devoted to plantings, since the area could not practically be used for parking.

The issue of access control has occurred at a number of other locations studied in this report. This is a region-wide problem and one which is faced by all communities. If the region were to embark on a systematic, rigorous program of access control along major highways, this could become a program of significant benefit to the Cape.

TIME PERIOD

VEHICLE VOLUME

Date

WEDNESDAY
JULY 8, 1970

From

1:30 pm

SUMMARY SHEET

To

5:30 pm

Weather

FAIR, WARM

LOCATION

ROUTE 28 and SOUTH SEA AVENUE, YARMOUTH

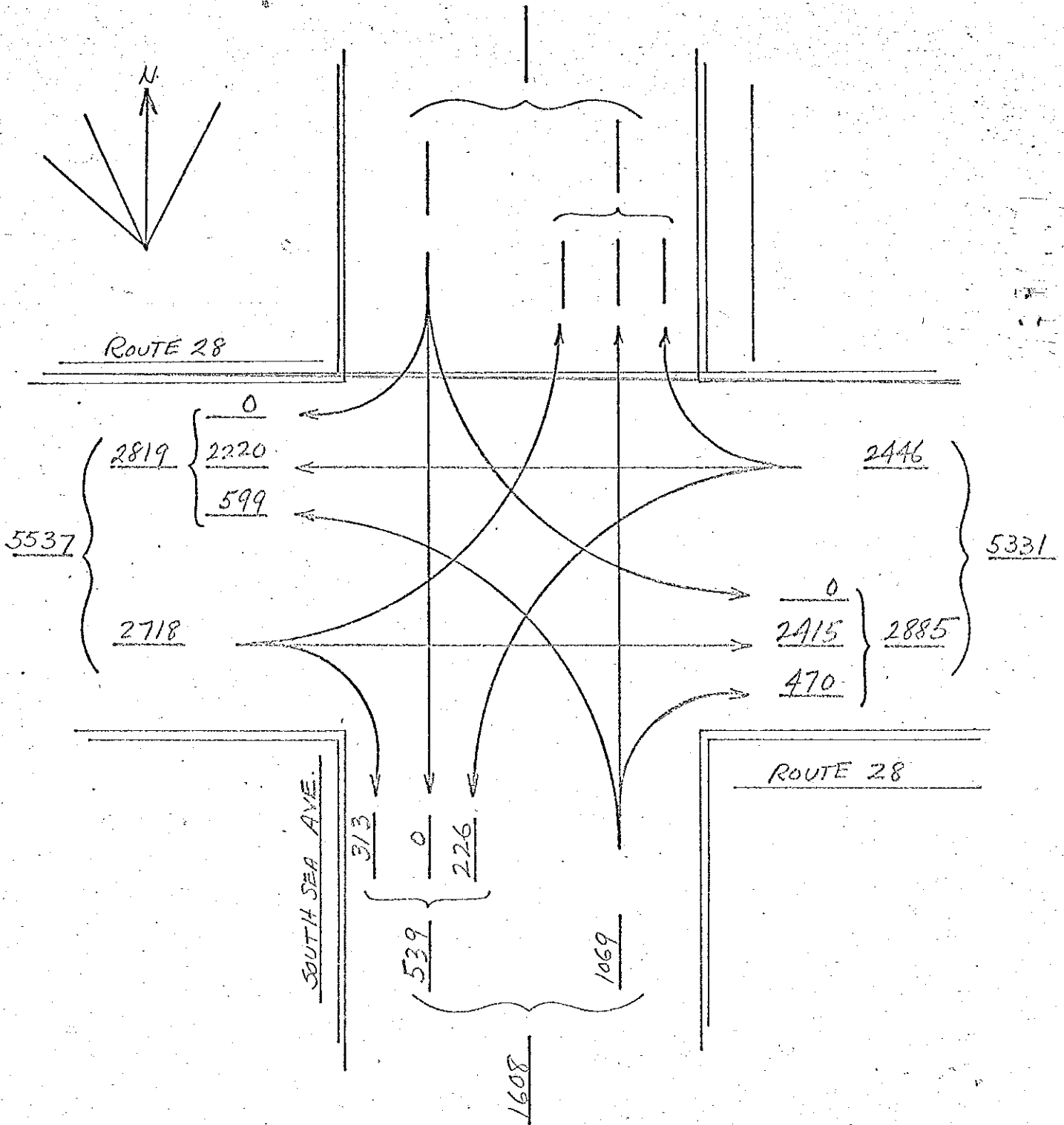


Figure 19

TIME PERIOD
From 1:30 pm
To 5:30 pm

VEHICLE VOLUME
SUMMARY SHEET

Date WEDNESDAY
JULY 18, 1970
Weather FAIR, WARM

LOCATION ROUTE 28 and WINSLOW GREY ROAD, YARMOUTH

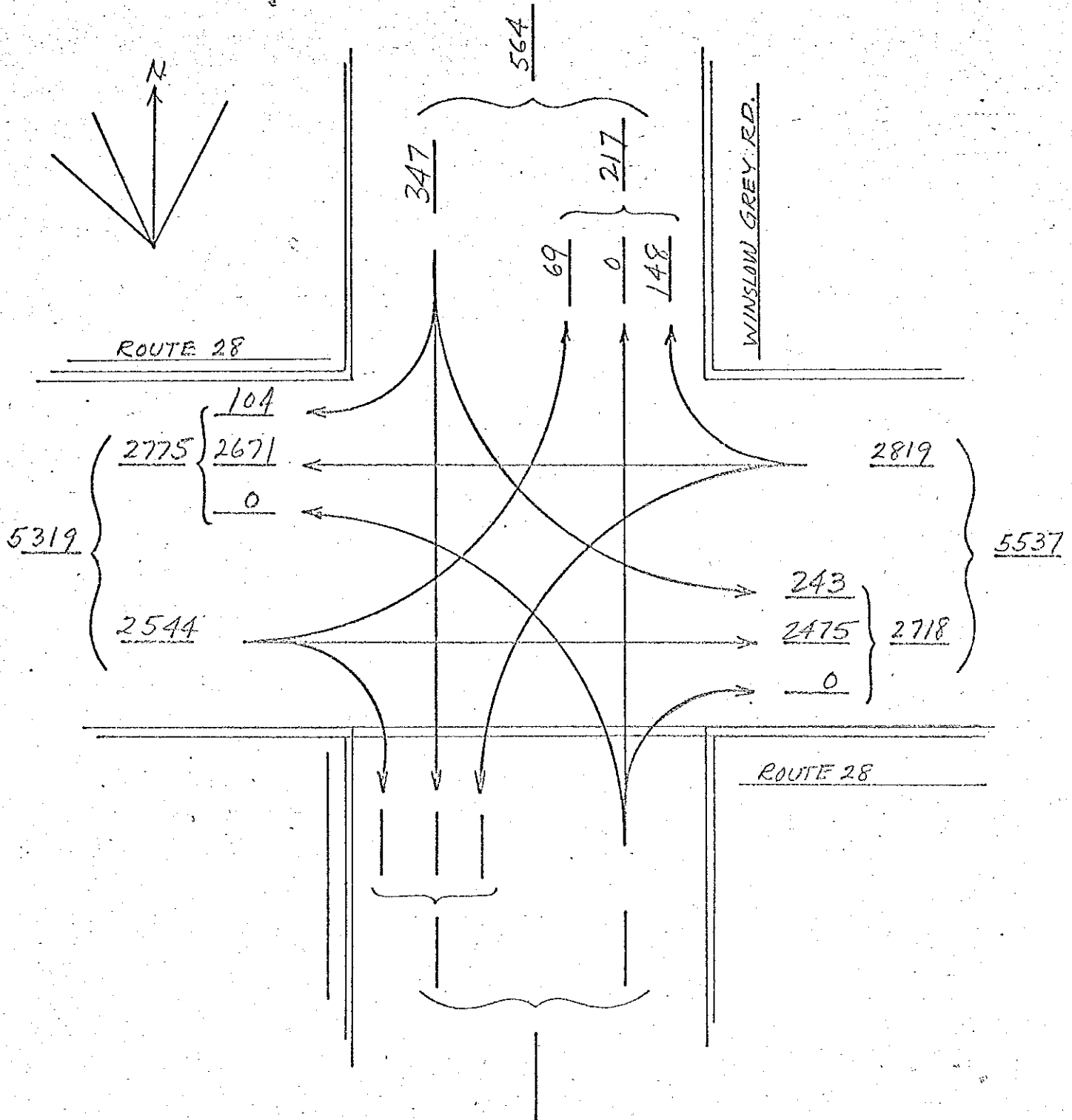


Figure 20

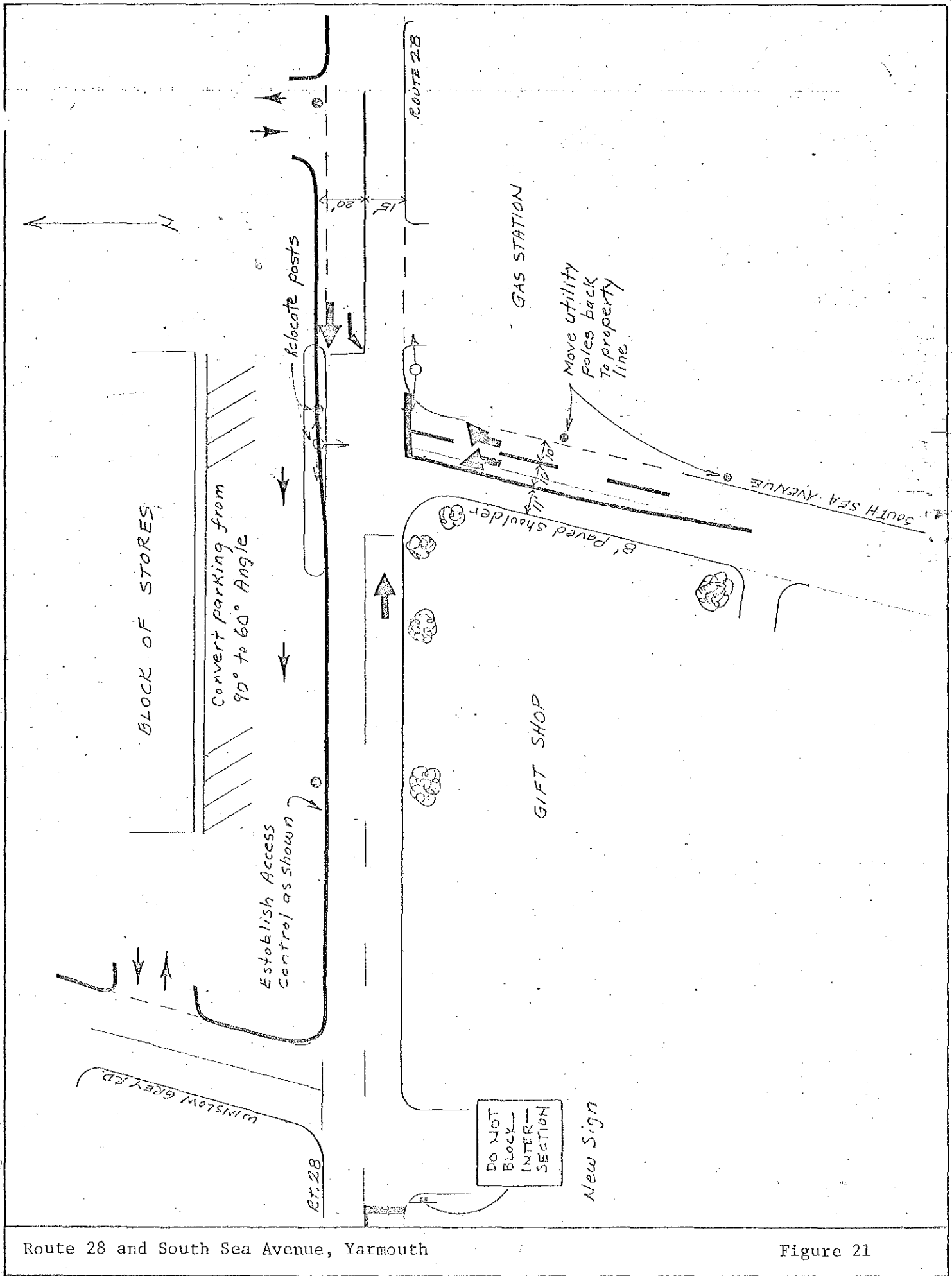


Figure 21

BARNSTABLE

Park Square

Main Street-Camp Street-Park Street- Lewis Bay Road

General Discussion

The channelization at this intersection represents an earlier attempt at resolving a traffic problem. It is a good example of the rotary design which was used to solve multiple intersection problems, a technique that was especially popular in the late 1930's. More recently, this type of design has been found to be unsatisfactory, partly because of its limited traffic capacity and partly because the design is not applicable to most intersection situations.

The rotary in recent years has been found to be ineffective in treating a situation where there is one large volume of through traffic. As a rule, where there are large volumes of intersecting traffic such as in this case, a traffic signal is much more efficient than a rotary. Rotaries, to be effective, must have large radii -- on the order of 300 feet or more -- so that there is sufficient weaving distance between intersecting roadways. A rotary is ideal where a number of light-to-medium volume roads intersect, where most of this traffic is turning, and where there is no predominant flow of traffic. This situation is not the case at Park Square. Park Square is an urban intersection with high traffic volumes.

In considering improvement to this intersection, recognition must be given to the high quality design of the island. It includes a number of large trees, shrubs, bushes and markers, all of which are well maintained. It is an attractive area that should be preserved.

Main Street, east and west of the intersection, is a two lane, two way roadway about 30 feet wide. It has been assumed that Main Street would continue to function this way and will not be widened beyond its present width to provide for more than one moving lane in each direction. Major traffic movements are straight through traffic on Main Street and the eastbound movement from Lewis Bay Road. (See Figure 22.) The traffic volume on Lewis Bay Road is imbalanced because it functions as part of a summertime one way system in downtown Hyannis.

Problems

The most obvious problem with the intersection is the lack of weaving distance on Lewis Bay Road between Park Street and Main Street. Heavy left turns from Lewis Bay Road into Main Street often block eastbound Main Street traffic which goes around the rotary in a counterclockwise direction. Because westbound Main Street traffic is heavy, left turn traffic from Lewis Bay Road into Main Street, which is controlled by a STOP sign, stacks up in a solid line beyond (south) Park Street. This has the effect of blocking eastbound Main Street traffic even though east of the intersection, Main Street is clear. Park Street traffic with a much lower volume is also affected by this blockage. Traffic from Lewis Bay Road to Camp Street conflicts with westbound Main Street traffic. This is less of a problem, however, because of the lower traffic volumes involved.

In addition to the basic problem of capacity and blockage resulting from the existing roadway layout there are other contributing factors. There is a lack of pavement markings which clearly identify lanes. These would assist motorists in getting themselves at the right place at the right time. Curb parking at strategic locations limits the amount of roadway that can be used

for moving traffic and thus contributes to capacity reduction. The disruptive left turns from Lewis Bay Road into Main Street westbound is controlled by a STOP sign which fails to recognize the importance of this left turn. It is almost equal to the volume of through traffic westbound on Main Street. Under present conditions, with two lanes on Main Street available at this point, Lewis Bay Road traffic should be allowed a continuous free left turn while traffic on Main Street is confined to a single continuous lane.

Recommendations

Since the rotary system operates well under low volume conditions and eliminates a number of traffic conflicts, it is proposed that the recommendations contained below be instituted on a summer basis only and that the existing pattern continue in force during the off season. For peak traffic flows, however, a change in the routing of traffic should be instituted. Any proposal, however, should not interfere with existing channelization since it would be used during most of the year.

Figure 23 shows a proposed traffic pattern for peak seasonal conditions. In this plan, Park Street would become two way between Main Street and Lewis Bay Road. This arrangement would allow traffic from Lewis Bay Road to turn left on Park Street westbound. Main Street eastbound traffic would now continue straight on Main Street rather than make the loop around the park. Eastbound traffic on Main Street headed toward Lewis Bay Road and Park Street would continue to use Park Street. The left turn from Main Street to Park Street would still be permitted. Lewis Bay Road between Park Street and Main Street would continue to be one way for eastbound traffic (a heavy volume) and for traffic headed toward Camp Street. The latter is a moderate volume and probably can be made without police control except during unusually high peak periods.

Waiting traffic will not interfere with the basic through movements on Main Street or from Lewis Bay Road eastbound. Traffic from Camp Road to Lewis Bay Road would continue to follow the same route, except that a left turn across eastbound Main Street traffic would be necessary. It is expected that at the intersection of Park Street and Main Street police officer control will still be required. However, one person should be able to handle the intersection.

What the change in traffic pattern accomplishes is that eastbound Main Street traffic is no longer blocked by standing westbound traffic from Lewis Bay Road. There is some modification to the channelization at the west end of the intersection; however, the change is minor and can also serve the rotary circulation pattern.

All curb parking should be removed from the intersection limits on Main Street, Park Street and Lewis Bay Road. There is only one business building in the entire intersection and its parking needs can be filled on Camp Street.

It would be a simple matter to signalize this "double" intersection so that Lewis Bay Road-Camp Street traffic and Lewis Bay Road-Main Street traffic can run simultaneously. In view of the high cost of a signal installation that would be required here, along with the potential aesthetic damage that could result, it would take a long time before the cost of policing would equal the cost of a signal. With traffic volumes and general summer activity, it is quite likely that one or two policemen would be stationed in this area anyway.

The entire solution is based on the assumption that Main Street will continue to function as a local service road and that the town does not seek to make this street a high capacity arterial route. As noted in the previous section, a slight modification of the Lewis Bay Road-Main Street stop control would

be useful even when a rotary traffic pattern is in effect. (See Figure 24.)

In view of the minor costs and alterations involved, it is suggested that these changes be instituted for next summer's traffic load. Some pavement markings, signs and a reconstruction of the island is all that is needed.

TIME PERIOD
From 1pm
To 5pm

VEHICLE VOLUME
SUMMARY SHEET

Date MONDAY
JULY 6, 1970
Weather FAIR

LOCATION PARK SQUARE, HYANNIS

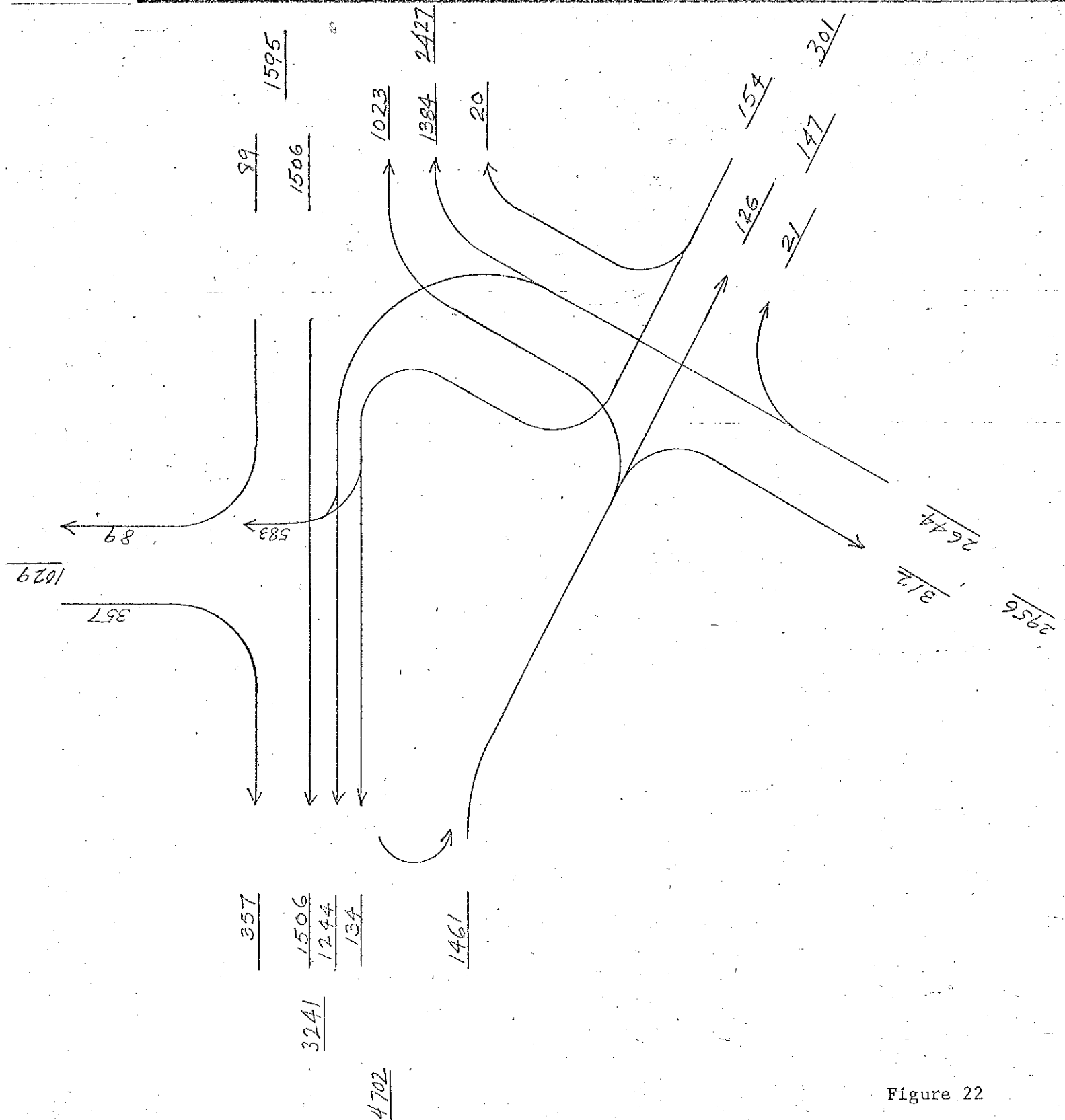
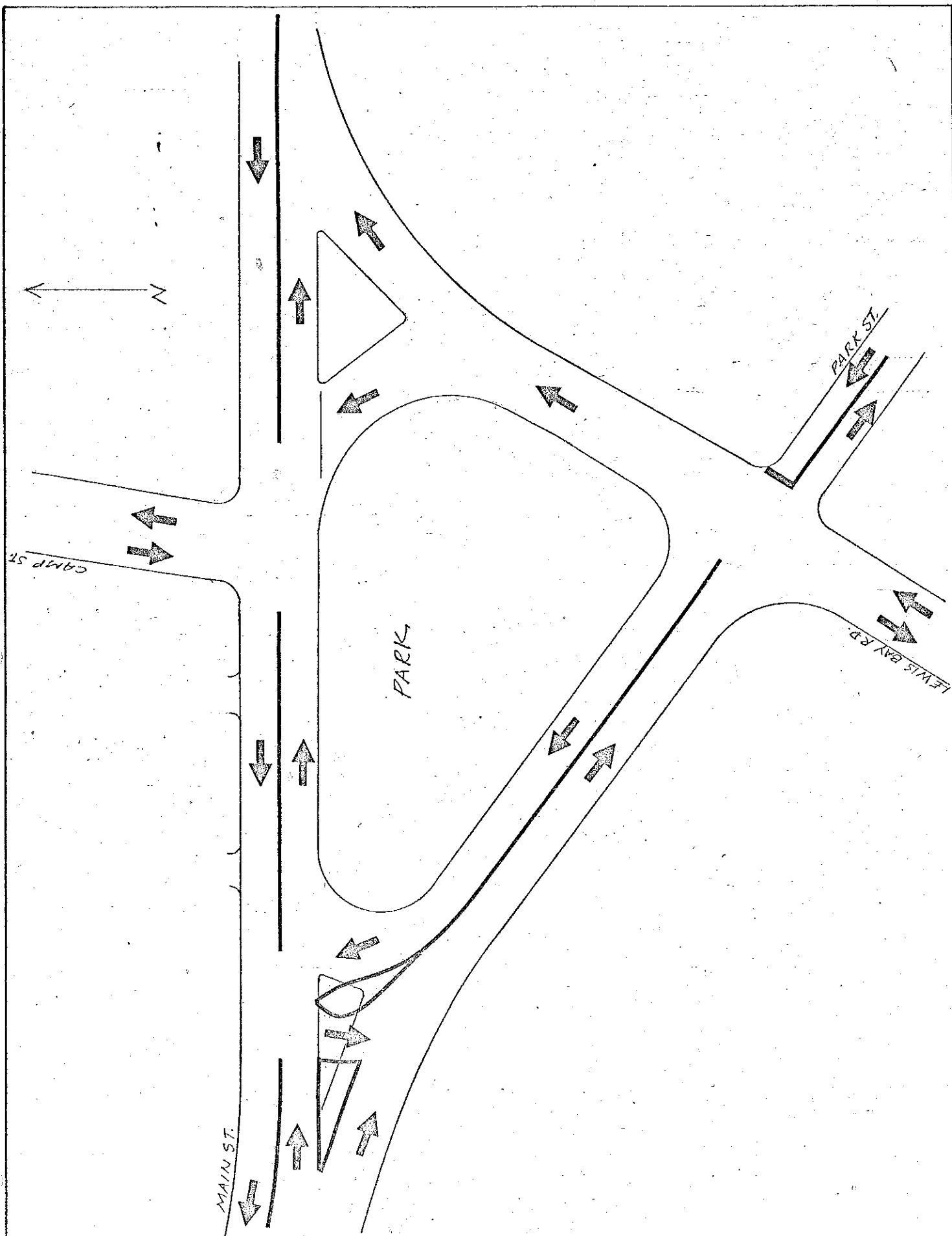
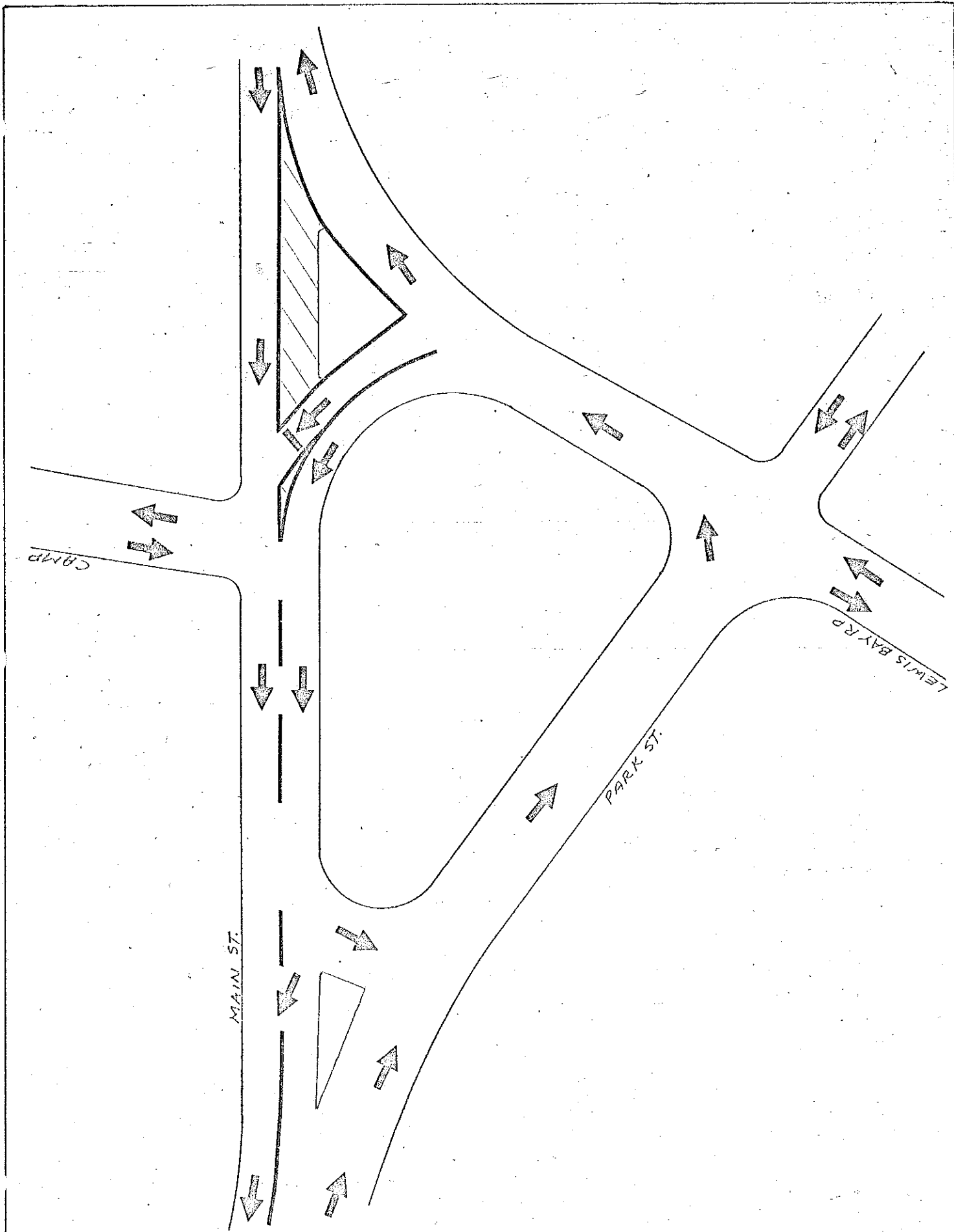


Figure 22



Park Square, Barnstable

Figure 23



Park Square, Barnstable

Figure 24

MASHPEE

Route 130 -- Speed Zoning

General Discussion

The traffic problem chosen for Mashpee involves speed zoning along an arterial road. Although Pine Tree Corner, the five road rotary on Route 28 was originally chosen as the intersection to be studied in Mashpee, there is little that needs to be done at this location. Traffic operates well even during high volume periods, although there are some minor conflicts which result because of driveways directly on the rotary.

The shopping center at the northwest corner of the rotary is an excellent example of how to treat this kind of situation. Access to the shopping center is located well back from the rotary, a minimum of 500 feet. Furthermore, on Route 28, the higher volume boundary road, the pavement has been widened by an additional lane on the shopping center side to provide for acceleration and deceleration of shopping center traffic. Perhaps the greatest problem with the rotary is that two driveways are located just beyond entering roadways. What this causes is a right angle conflict where it is least expected by the oncoming motorist. This problem could be resolved by locating driveways in between intersecting roads so that there is at least some weaving distance, thereby eliminating the right angle conflict.

The problem and recommendations sections for Mashpee, however, deal with the problem of speed zoning.

Problems

Route 130 through Mashpee has only two speed limit signs on it, each one located at the town line. Northbound on Route 130 through Mashpee the speed

limit is 40 miles per hour and southbound on the same road it is 45 miles per hour. There is no clear reason why there should be a differential in speed limits based on direction of travel.

On Waquoit Road there is a speed limit sign northbound, just beyond the rotary. However, prior to the school speed limit zone, in the center of Mashpee, there is a "Speed Limit 30" sign which provides a speed zone transition for northbound traffic. The 30 mile per hour speed is not primarily related to the school zone, but was established because Waquoit Road comes to an end at Route 130 and traffic must come to a stop before turning. On Route 130, however, traffic may continue through the intersection and, therefore, no attempt has been made to speed zone this area.

When the school speed limit sign is in operation, traffic must slow down from a 40-45 mile per hour speed to a speed of 20 miles per hour with no advance speed transition zone. As a result, traffic oftentimes travels through the 20 mile per hour speed zone at a higher rate of speed.

This intersection is the center of Mashpee. In addition to two schools located here, there is a general store and fire station among other uses. Although turning movement counts were not made here, they are frequent. They add to the village atmosphere of the area which is, in part, the reason for the suggested change in speed zoning.

Recommendations

In view of the schools and other development at this location, it is recommended that a 35 mile per hour speed limit be established on Route 130 between Lovell's Road and South Sandwich Road, a distance of approximately 1,500 feet in each direction from the intersection of Waquoit Road. (See

Figure 25.) The 35 mile per hour speed zone would take care of the speed transition between 45 miles per hour and 20 miles per hour during school periods, and would also advise motorists that a reduced speed situation confronts them.

By coincidence, Lovell's Road and South Sandwich Road provide convenient speed zone boundaries for this area. This would provide sufficient room to locate a speed zone sign prior to the school speed zone. (A minimum of 850 feet is required between the beginning of a speed zone and school grounds in rural areas.) This should also provide a reasonable transition zone to enable vehicles to slow down comfortably, particularly in a southbound direction where a 25 mile per hour reduction in speed is required. The speed zone situation on Waquoit Road is satisfactory and should remain as is. The town should initiate the procedure for the establishment of a legal speed zone as outlined in the Massachusetts DPW's "Manual of Uniform Traffic Control Devices," Section 7A-9.

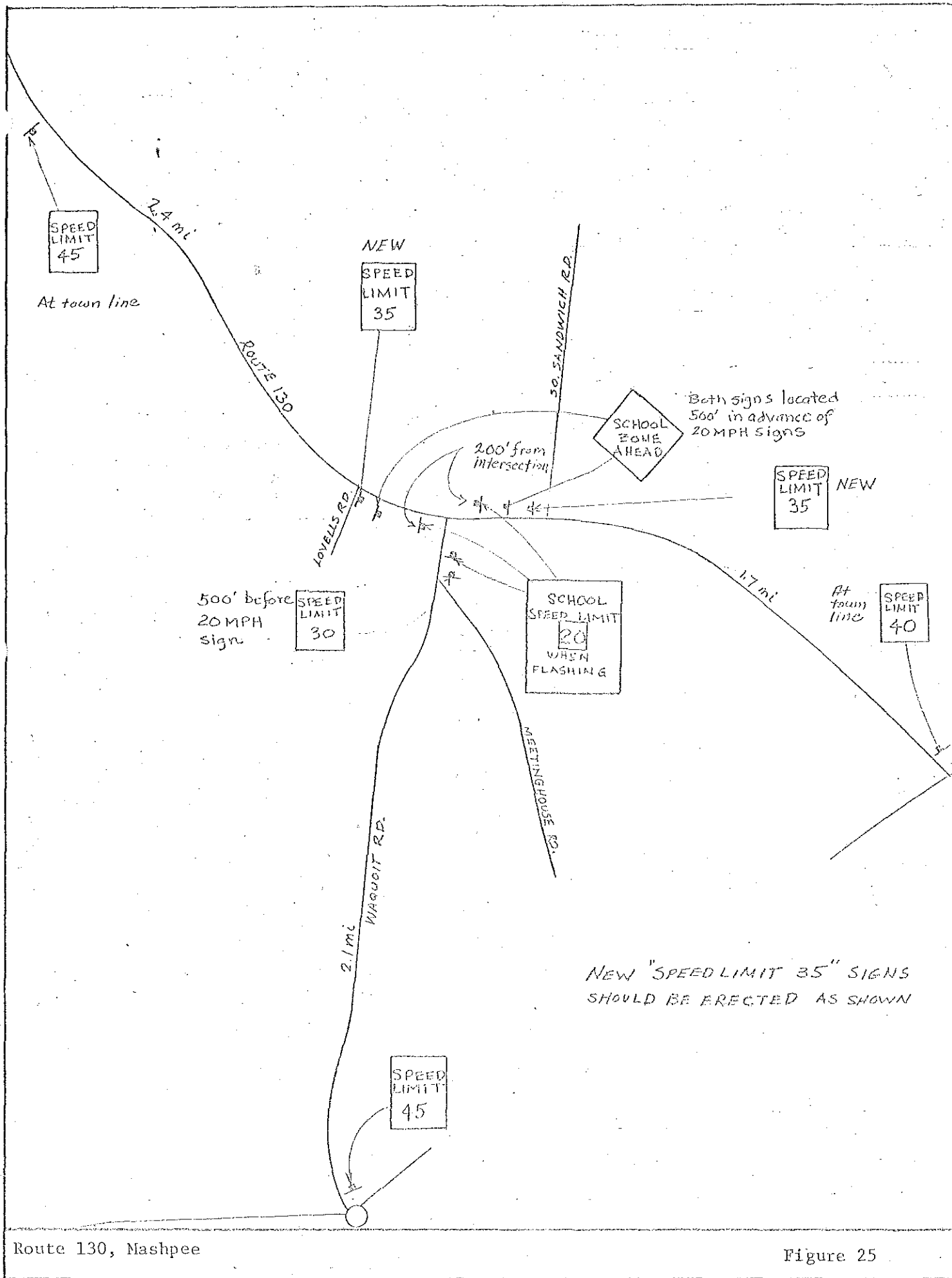


Figure 25

SANDWICH

Route 6A and Tupper Road

General Discussion

Tupper Road serves all of the development in the northeast corner of Sandwich including the activities along the north portion of the Cape Cod Canal. In addition to year-round and seasonal residences, there are commercial and industrial uses served by this road, including the Cape's only power generating plant, fish packing, marina activities and related small businesses -- all of which generate a sizeable volume of trucks. Route 6A west of Route 130 carries some of its highest volumes. In this area traffic travelling on Route 6A for scenic purposes and traffic generated in the northern part of Sandwich and Barnstable combine. This section of 6A was noted in the planning report on highways done last year as being one where existing summertime traffic volumes are close to the capacity of the roadway.

The vicinity of the intersection is free of roadside development. Any problems at Tupper Road are more noticeable than they would be in a location where there is continual congestion such as Route 28 in Yarmouth.

In addition to the moderate turning movements at the intersection, the geometric design also causes problems. Although there is some channelization at the throat of the Tupper Road intersection, the connection between Routes 6A and 130 is wide open. Both Route 6A and Tupper Road have adequate width for two lane, two way movements. In this regard, Tupper Road is very well suited to carry its volume, including large trucks.

There are no current highway proposals that would reduce the traffic volumes at this intersection, so that any improvements which are made should have long-term benefits and implications.

Problems

The Tupper Road intersection cannot be separated from the surrounding area including the unpaved extension to Route 130 and the Route 130-Route 6A "Y" intersection. There is a great deal of open pavement and other space available for making the variety of turning movements which contributes to the confusion and problems here. For example, westbound traffic on Route 130 often uses the unpaved portion of Tupper Road to by-pass the STOP sign at the intersection. This movement is disruptive and dangerous. The angle of approach of Route 130 into Route 6A is obsolete by today's standards and should be modified to eliminate the almost head-on conflict. Pavement conditions at the intersection range from poor to fair; road markings are uniformly poor.

Through traffic on Route 6A is the single most important movement; however, the movements into and out of Route 130 and Tupper Road account for over one third of the total traffic movements in the area. Traffic volumes (Figures 25 and 26) suggest a major modification of this entire intersection area.

Adding to the intersection's problems in a marginal way if not in a direct way is the lack of sight distance on Route 6A. From both the east and west, visibility of the Tupper Road intersection is limited to between 500 and 800 feet. This distance is within the recommended stopping sight distance based on the observed speeds at the intersection, but could be a problem for tourists. For traffic exiting from Tupper Road, the right turn is not difficult. For left turns and movements straight across Route 130, visibility to the east is marginal.

Recommendations

A solution which would solve the Tupper Road problem as well as the problem of traffic from Route 130 would be to signalize the Tupper Road-Route 6A intersection with provisions for Route 130. A signalized right-angle intersection could be built which would utilize areas that are now within the rights-of-way of either Tupper Road, Route 6A or Route 130. The intersection movements are such that the heaviest movements would run simultaneously while the light to moderate movements would also run together.

Figure 28 shows a sketch of the proposed layout. Through traffic on Route 6A would be unaffected except when the light is red. Eastbound traffic to Route 130 is unaffected; however, the westbound traffic route is rerouted so that instead of the STOP sign and a head-on conflict, the movement is now made under the control of a traffic light and at a 90 degree turn. Right turns into and out of Tupper Road would be unaffected since it is proposed that both movements continue as YIELD or free movements. One way of handling the left turn from Route 6A into Tupper Road is by using a "jug-handle" design. Tupper Road traffic would go down Route 130, make a left at the Tupper Road extension, and then cross over Route 6A at the signal. This movement would eliminate left turn storage on Route 6A, solving the sight distance problem. The extension of Tupper Road between Routes 6A and 130 would be two way to allow the occasional movements that go from Tupper Road directly into Route 130 eastbound and left turns from Route 6A into Route 130. Traffic on the Route 6A green would be almost entirely straight through traffic. When Tupper Road has the green, the major movement would be the left turn from Route 130 into Route 6A westbound. This can be seen in the phasing diagram. Left turning traffic into Tupper Road could also move at the same time.

At the existing intersection of Routes 130 and 6A all conflicts and turning movements would be eliminated. Out of the four major movements here, only one -- from Route 130 to Route 6A west -- is affected.

The intersection should be designed so that small trailer trucks can be accommodated, possibly with some infringement on nearby lanes when turning. This would be acceptable in view of the limited volume of trucks and the short season.

Because shutting traffic lights off during the low traffic periods is not done, the signal should be a semi-actuated type. Traffic on Route 6A would be allowed to flow continuously unless there is a call for a left turn into Tupper Road, a left turn out of Route 130 to Route 6A, or traffic coming out of Tupper Road heading east. Even during the busy summer season, Route 6A traffic will have a majority of green time while the other movements are handled in a fairly short period of time.

On an interim basis, some improvements can be made with channelization. Of value would be the construction of an island at the existing intersection at Routes 130 and 6A so that westbound traffic can stop closer to Route 6A, have better visibility and be under some control. A second improvement would be to more clearly define Tupper Road south of Route 6A so that vehicles are not allowed to wander all over the place.

Another change of greater importance would be the construction of a second lane eastbound between the intersection of Route 130 and Tupper Road. The additional lane would be a left turn storage lane for traffic entering Tupper Road while Route 6A through traffic is allowed to by-pass it. Because the area is now owned by the DPW, this would be easy to do. There would be no right-of-way requirements, merely the construction of about 300 feet of additional traffic

lane at grade. The left turn would be made at Tupper Road as it now is; however, the ability of left turn traffic to keep out of the way of through traffic in both directions would improve the situation considerably. (See Figure 29.)

TIME PERIOD
From 8:30 am
To 12:30 pm

VEHICLE VOLUME
SUMMARY SHEET

Date THURSDAY
JULY 16, 1970
Weather HUMID

LOCATION ROUTE 6A and TUPPER ROAD, SANDWICH

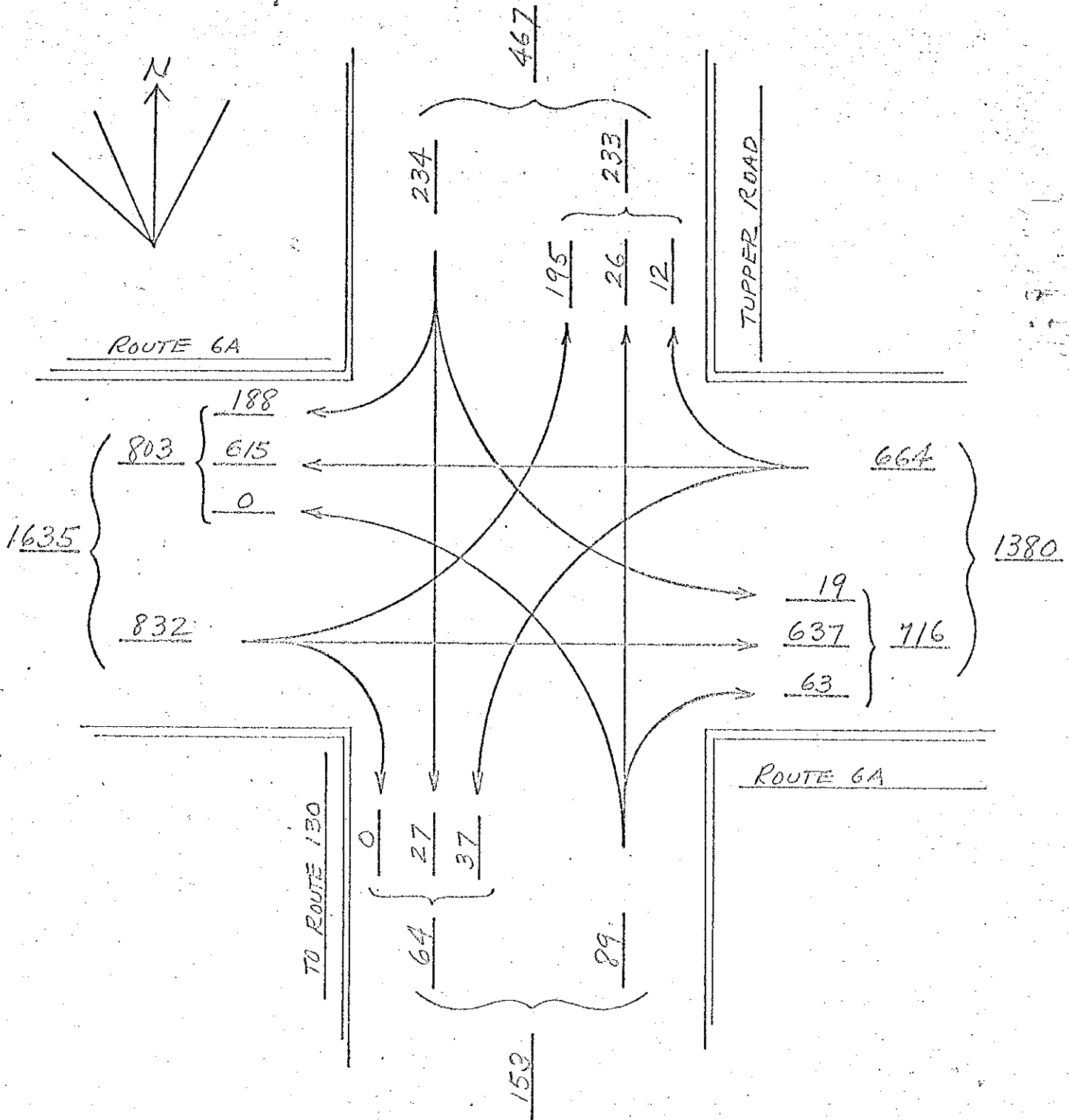


Figure 26

TIME PERIOD
From 8:30 am
To 12:30 pm

VEHICLE VOLUME
SUMMARY SHEET

Date THURSDAY JULY 16, 1970
Weather HUMID

LOCATION ROUTE 6A and ROUTE 130, SANDWICH

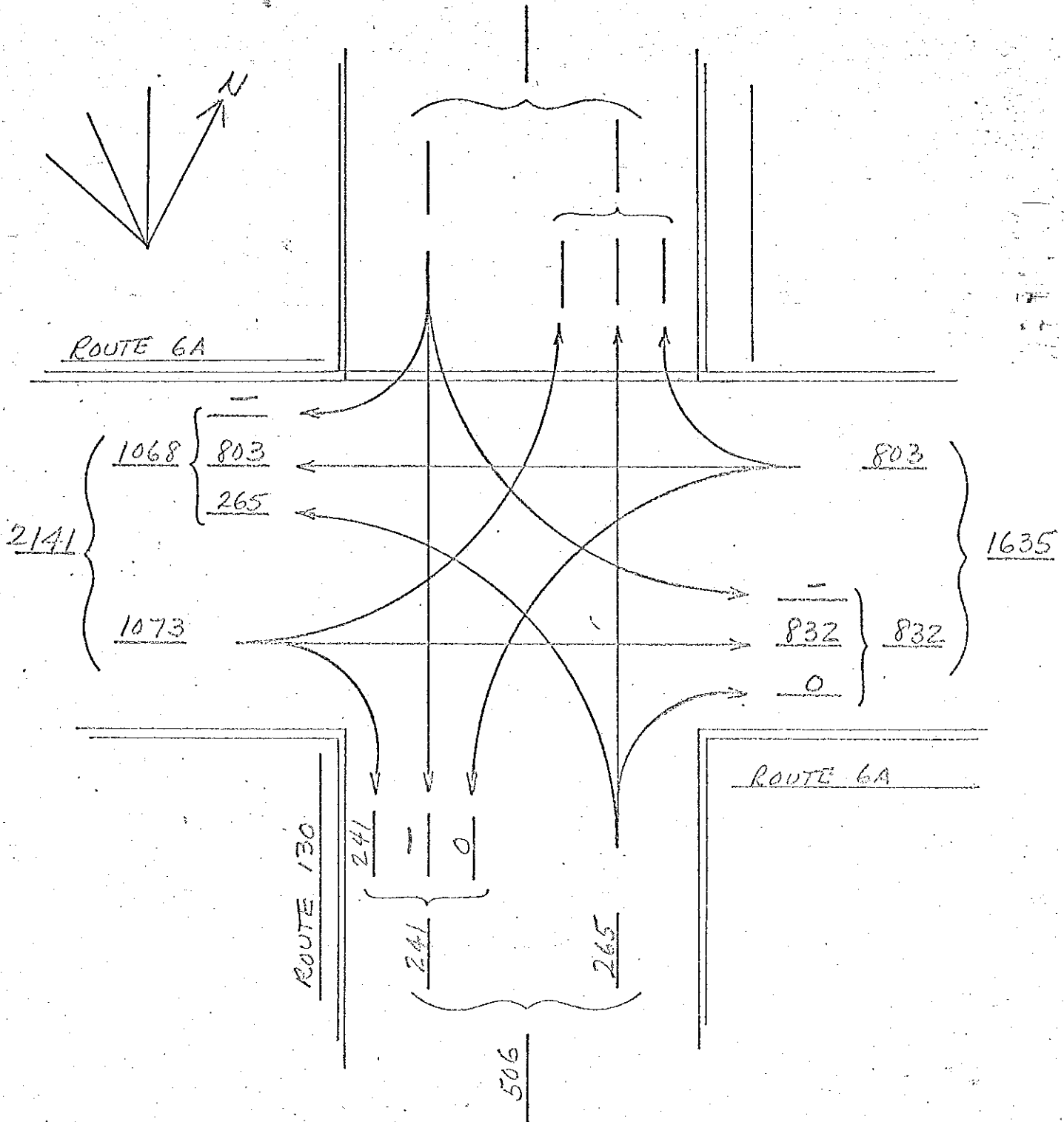
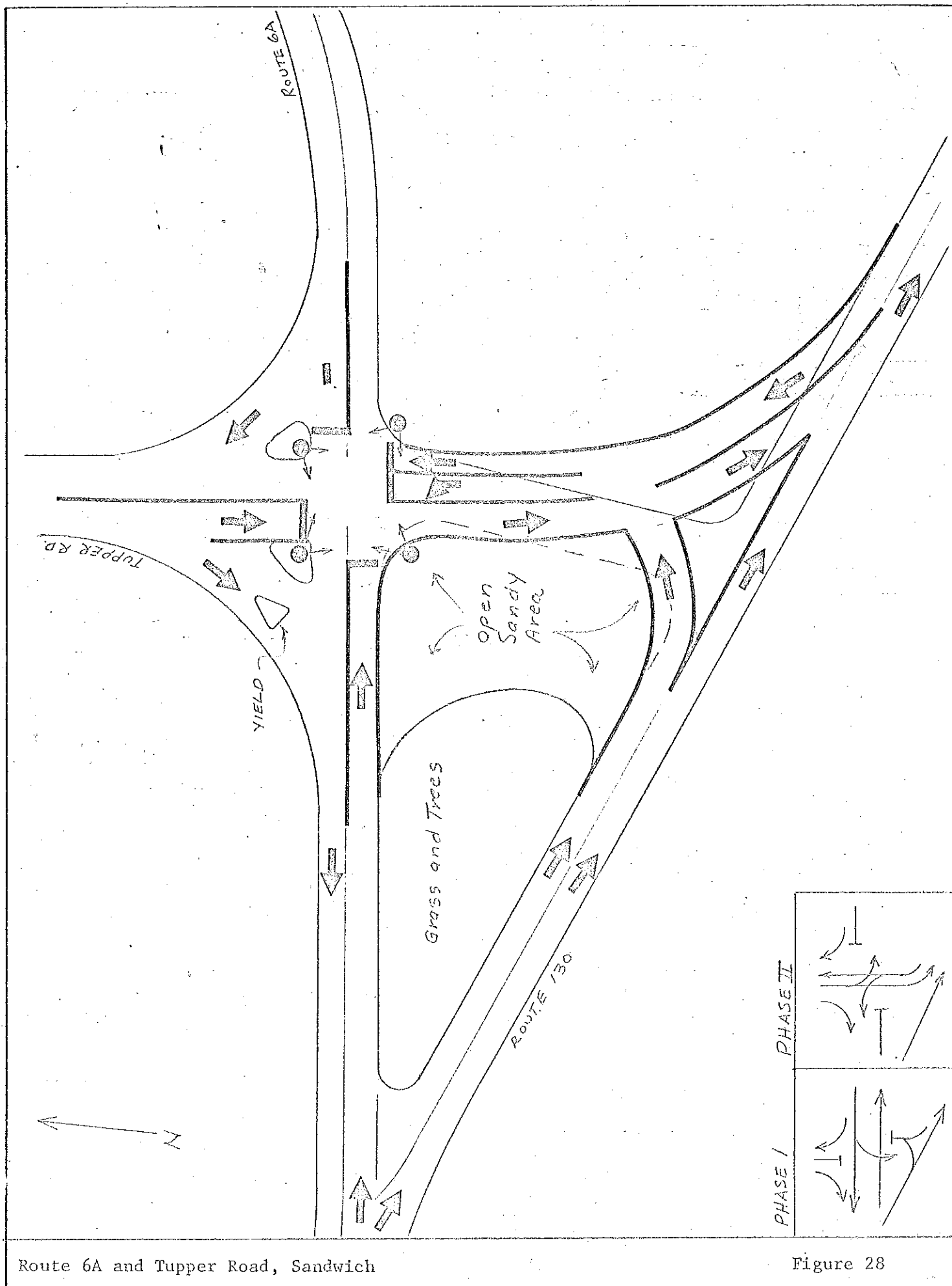
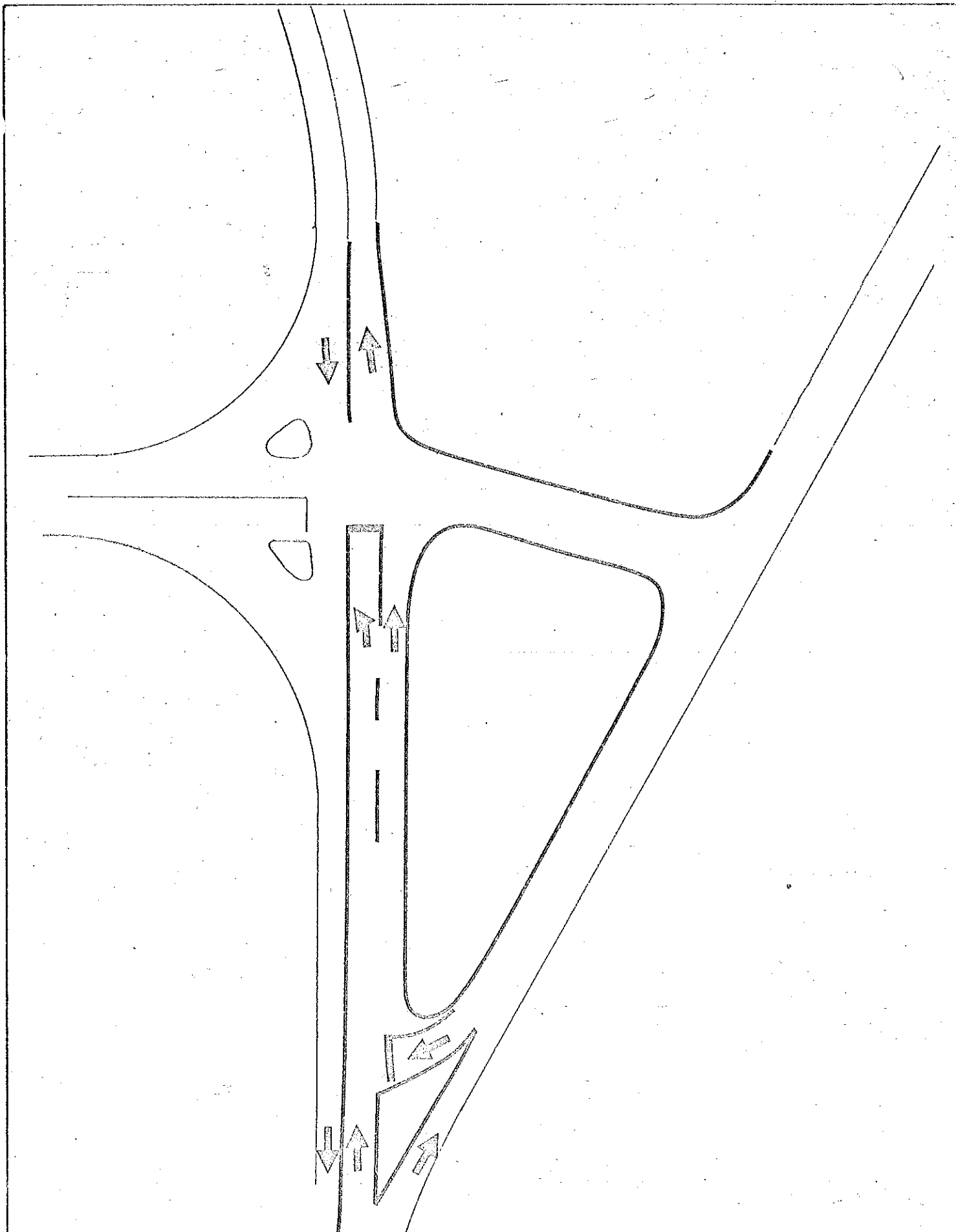


Figure 27



Route 6A and Tupper Road, Sandwich

Figure 28



Route 6A and Route 130, Sandwich

Figure 29

BOURNE

Bourne Five Corners

General Discussion

Only the light volume of traffic using this intersection has kept it from becoming notorious. The intersection consists of six roads which converge at one point, characterized by an expanse of unmarked, unchannelled asphalt. Complicating the problem at this intersection are some poorly located and poorly designed commercial driveways.

The general vicinity of the intersection is aesthetically pleasing, partly because of careful plantings and the lack of signs both on public and private property. Recommended changes have been carefully planned to maintain the high quality appearance of this intersection.

The major route through the intersection is between the Bourne Bridge rotary and Monument Beach. This is not only obvious from travelling the roads, but is clearly shown in the traffic volume figures. (Figure 30.) County Road serves a large part of the Bourne shore but the area it serves can be reached more easily by Route 28 and other roads.

Future prospects for traffic growth at this intersection relate to its local service function -- the small commercial establishments in the immediate vicinity. Because of its location in a corner of the town and of Cape Cod itself, no heavy increase of new traffic is expected. Traffic growth in the area will be more directly related to new development which occurs in the Monument Beach area and by gradual increases in recreational traffic volumes.

Problems

Most of the problems at this intersection stem from the lack of positive traffic control and the lack of definition of the travelled way through the intersection. For motorists approaching the intersection, it is impossible to tell which roads are the main ones and which ones are the secondary ones.

Another problem at the intersection relates to the lack of channelization. It appears that existing channelization was put in for planting purposes and represents an early attempt at directing traffic. However, the channelization is not functional and does little to control traffic.

Lack of sight distance on the shore road approach is a problem at this intersection. This is the major flow of traffic and although there are no control signs which stop traffic, most prudent drivers come to a rolling and often a complete stop before proceeding.

The new block of stores does not pose a major problem for the intersection; however, the 90 foot driveway on Trowbridge Road right at the intersection causes unnecessary conflicts.

In general, the intersection lacks definitive traffic controls. Directional signs also need some modifications without necessarily increasing their number. Tourists faced with this intersection often slow down to read signs and reaffirm their course.

Recommendations

Improvements to this intersection lie in the area of additional channelization and access control. Figure 31 shows the proposed changes for this intersection. The emphasis is on improving the through movements between Trowbridge Road and

Shore Road. Although Waterhouse Street has the appearance of a major road because of its straightness and broad width, from a traffic point of view it is a minor road. Traffic exiting at the intersection should be required to stop before entering Trowbridge Road.

The plan attempts to provide a simple intersection where through traffic is allowed to continue without stopping while side road traffic with much lower volumes is required to come to a stop. The left turn from Trowbridge into County Road which is the second largest movement at this intersection, would be given a separate left turn storage lane so that through traffic would not be affected. The channelization at the corner of Sandwich Road and Trowbridge Road has been eliminated to provide additional parking for the shopping area or for planting. The existing channelization merely adds to the massiveness of the paved intersection area.

The east driveway to the shopping center should be relocated so that it is opposite Waterhouse. The driveway at the intersection should be narrowed from 90 feet to 24 feet. It is far enough away from the intersection so that movements into and out of the parking lot will not interfere with intersection operations. From this point around the corner to Sandwich Road access should not be allowed.

The intersection can function quite well under present volumes with STOP sign control only. It is possible that the right turn from County Road into Trowbridge Road could be channelized and controlled by a YIELD sign rather than the STOP sign.

The additional land that would be made available, particularly through the relocation of Waterhouse Road could be used for a variety of purposes. In view of the extensive plantings in the vicinity, it is possible that some local group

may wish to utilize this additional area for plantings or a small park. The location would also provide an ideal site for a small public building or a local service club. Parking might also be a possibility here.

Traffic into Sandwich Road, except for the right turn from Trowbridge Road, would be prohibited at the intersection itself. Instead, this traffic would proceed on Trowbridge Road and make a left turn at one of the connecting roads between Trowbridge Road and Sandwich Road. Except for local destinations, people using Sandwich Road are probably headed toward the Sagamore Bridge and wish to avoid the Bourne Bridge rotary. Therefore, most of the vehicles which now turn into Sandwich Road would probably make the left turn further away from the intersection where it should create no problems.

All channelization can be made within the public right-of-way. For the most part, trees and plantings have not been affected. The traffic beacons should be relocated to a more prominent position as shown near the center of the intersection.

The possibility of a one way system was also considered using Trowbridge and Sandwich Roads as a one way pair. This would help to simplify operations at the intersection. However, a one way operation is not needed at the present time because the traffic volumes do not warrant it.

TIME PERIOD
From 1 pm
To 5 pm

VEHICLE VOLUME
SUMMARY SHEET

Date FRIDAY JULY 10 1970
Weather HAZY

LOCATION BOURNE 5 CORNERS, BOURNE

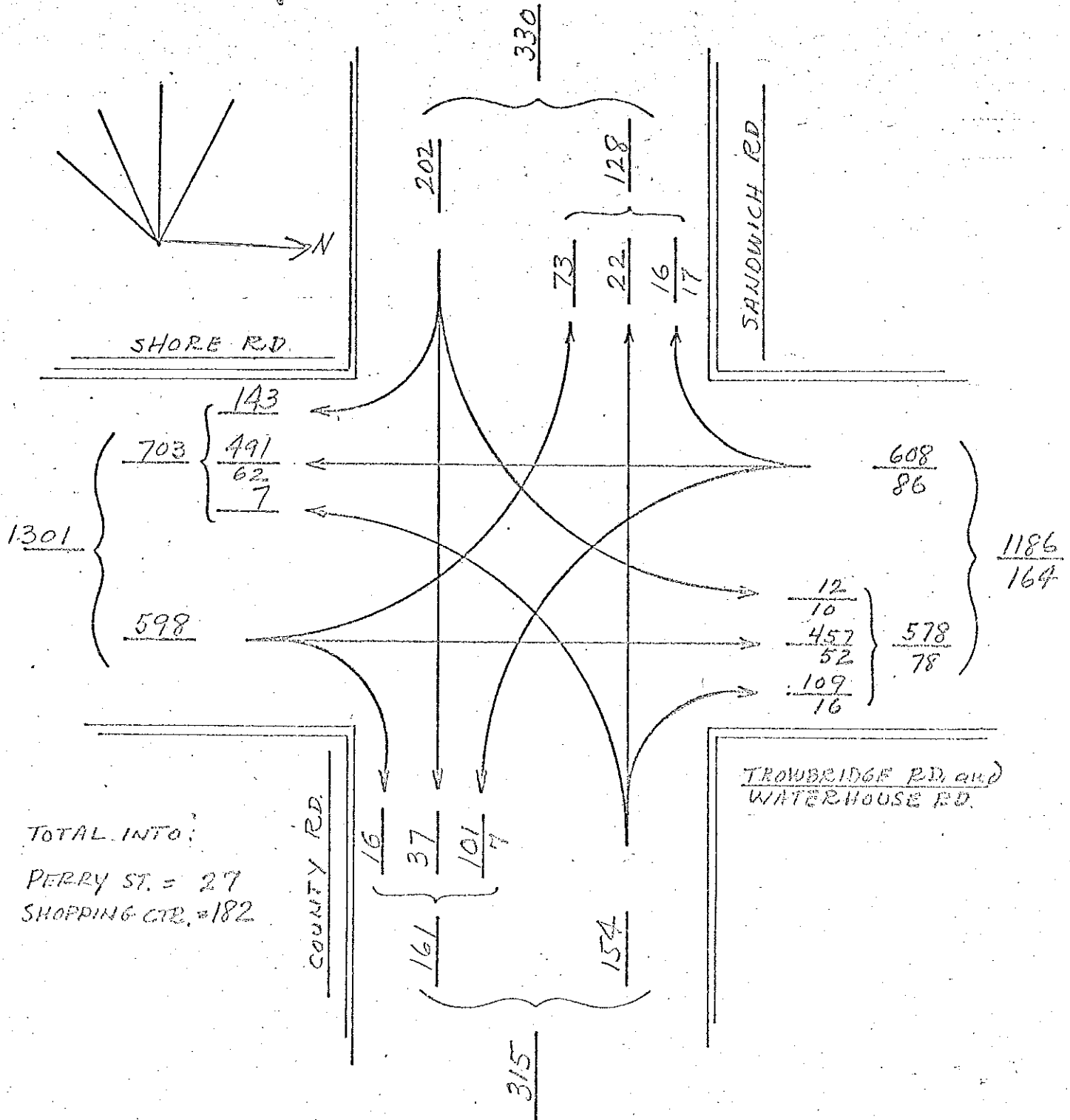
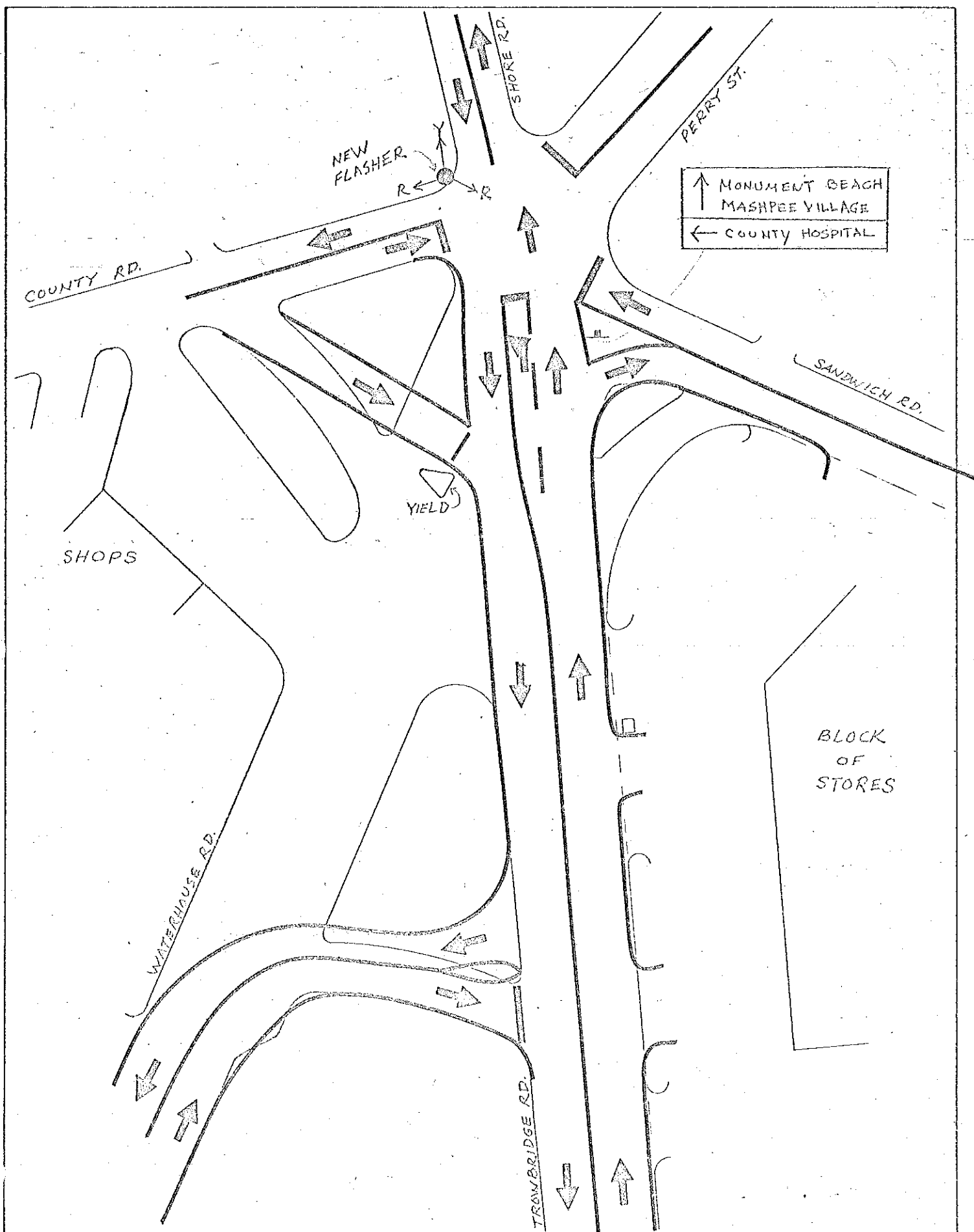


Figure 30



Bourne Five Corners, Bourne

Figure 31

FALMOUTH

Route 28 at Falmouth Plaza Shopping Center

General Discussion

Route 28 between Falmouth Heights Road and Spring Bars Road probably has more turning movements on it than any other 800 foot section of road on Cape Cod. A regional shopping center, two gasoline stations, several restaurants and a variety of other high volume, convenient goods outlets combine to make this one of the busiest spots in the county.

Traffic volumes at the shopping center driveways are comparable to Average Daily Traffic figures of 2,000-3,000 vehicles per day, more traffic than on many roads on Cape Cod. The sketch of the area (Figure 35) shows one of the advantages of large scale developments: fewer driveways. A reduction in the number of total driveways in this area would be one way to improve traffic operations for both through and local traffic.

The area that is of concern in this report is 100 percent saturated by commercial development on both sides of the road. While it may be unwise and unrealistic to permit such a concentration of development on a two lane road without specific provisions for increasing roadway capacity, the damage has been done insofar as roadside development is concerned. The ample set-back of buildings along this section of roadway suggests that a widening of the road might not come as a surprise or an unwelcome event.

Problems

The problem here is yet another example of what is becoming more common on Cape Cod: too many cars and not enough pavement. At this location it is unlikely that a by-pass for through traffic on Route 28 would have a major effect on total

traffic volumes. Through traffic is in the minority. Of 2,941 vehicles approaching in a northbound direction, 1,051 turn right at Falmouth Heights Road, 322 at exit 2, 255 at exit 3, and 144 at exit 4 of Falmouth Plaza. This does not include right turns into the gasoline station, Spring Bars Road or any left turns at all between Falmouth Heights Road and Dillingham Avenue. Clearly, redesign of this area must serve high traffic volumes, much of it oriented toward abutting property. Also, as the region's population grows, this area will continue to generate increasing volumes of traffic that would more than take the place of any vehicles that would use a by-pass.

Falmouth Heights Road which has a traffic volume of about half of Route 28 (See Figure 32) has well-designed channelization under the circumstances. The heavy traffic volumes on Route 28, however, still make it difficult for the left turn from Falmouth Heights Road toward Falmouth center.

One problem that the area faces, not of a traffic nature, is the lack of aesthetic quality. Although structures on both sides of the road have traditional architecture, the almost total disregard for amenities is noticeable. There have been some small attempts such as the installation of gas lanterns, a few small trees, and sign controls designed to preserve the appearance of the area; however, the numerous driveways, the mangy grass shoulders and the utility poles and wires predominate the scene. If the recommendations contained below are to be undertaken, serious consideration should be given to unifying and improving the looks of the area.

Recommendations

The construction of a totally redesigned four lane roadway between Falmouth Heights Road and Spring Bars Road would vastly improve traffic conditions on this section of Route 28. The room required for widening the road would come

from abutting property owners who would suffer a loss of parking spaces only, and comparatively minor costs in relocating signs and driveways. Widening should take place on both sides of Route 28, partially because both sides would benefit and partly because the design at both ends of the widened section would favor a symmetrical widening of Route 28 leaving the center line approximately in the same location. By limiting the widening between two existing roads, it is possible to utilize them more fully in the new design.

Because of multiple ownership on the east side of the road, not much can be done in combining driveways. However, some minor changes have been recommended. A larger number of driveways provides greater convenience for turning traffic while causing more problems for through traffic.

The added roadway capacity obtained by providing additional lanes through this area will permit the installation of traffic signals if they become necessary. Two lane approaches are necessary considering the high traffic volumes in this area. Under present conditions, traffic signals will not work because there is insufficient approach capacity.

It is possible that the increased roadway width, which would permit left turn storage and right turn deceleration space, might relieve the problem without the necessity of installing traffic lights. The increased width would alleviate the extreme congestion which occurs here. Traffic signals would eliminate a number of the hair-raising conflicts which take place. It is not expected that the widening would increase speeds, although it will take less time to get through the same area.

It would be desirable if abutters on the east side of the road could get together and redesign the entire frontage from Dillingham Avenue to Falmouth

Heights Road by providing one large parking area similar to Falmouth Plaza. This would offer greater flexibility in landscaping the area.

In summary, it is recommended that this section of Route 28 be widened to four lanes and that the construction include provision for traffic lights although these might not be necessary initially. The widening will require that all driveways be rebuilt. This provides an opportunity to replan the entire 1,000 foot section of roadway so that it might be treated as a unified area and designed accordingly.

TIME PERIOD
From 1 pm
To 5 pm

VEHICLE VOLUME
SUMMARY SHEET

Date SATURDAY JULY 11, 1970
Weather CLOUDY

LOCATION ROUTE 28 and FALMOUTH HEIGHTS RD.

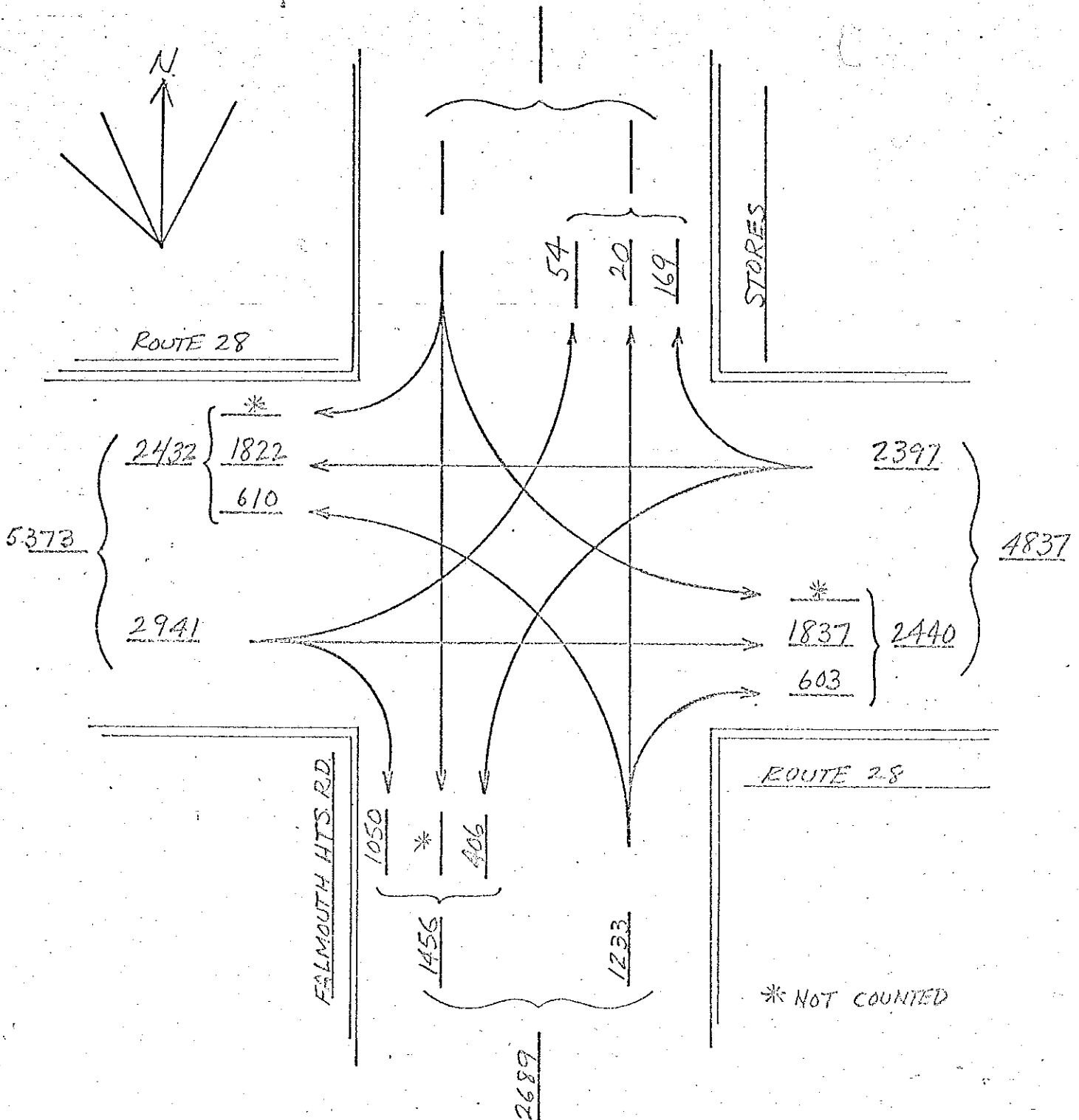


Figure 32

TIME PERIOD
From 1pm
To 5pm

VEHICLE VOLUME
SUMMARY SHEET

Date SATURDAY
JULY 11, 1970
Weather CLOUDY

LOCATION FALMOUTH PLAZA-EXIT 3

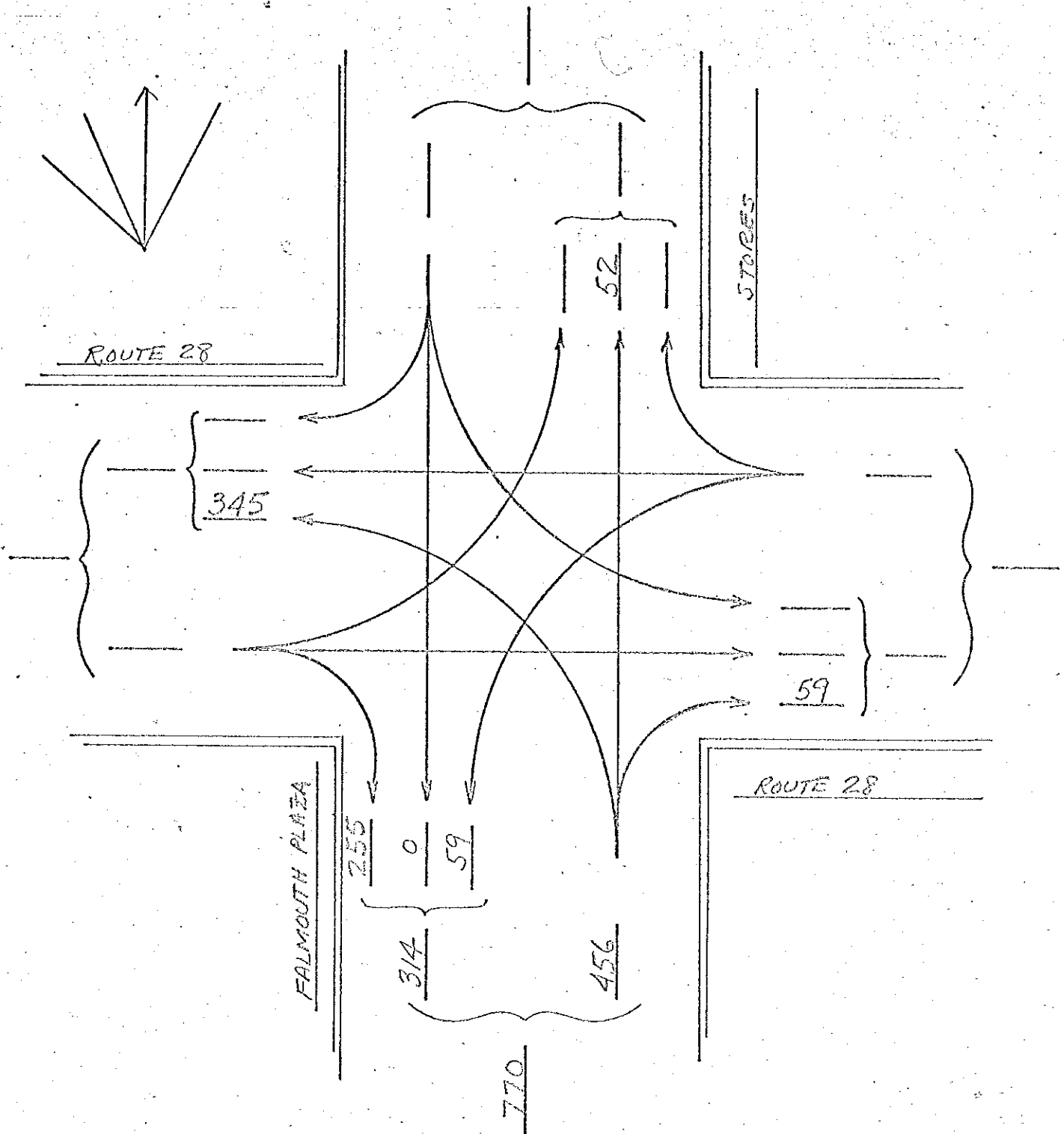


Figure 33

TIME PERIOD
From 1pm
To 5pm

VEHICLE VOLUME
SUMMARY SHEET

Date SATURDAY
JULY 11, 1970
Weather CLOUDY

LOCATION FALMOUTH PLAZA - EXIT 4

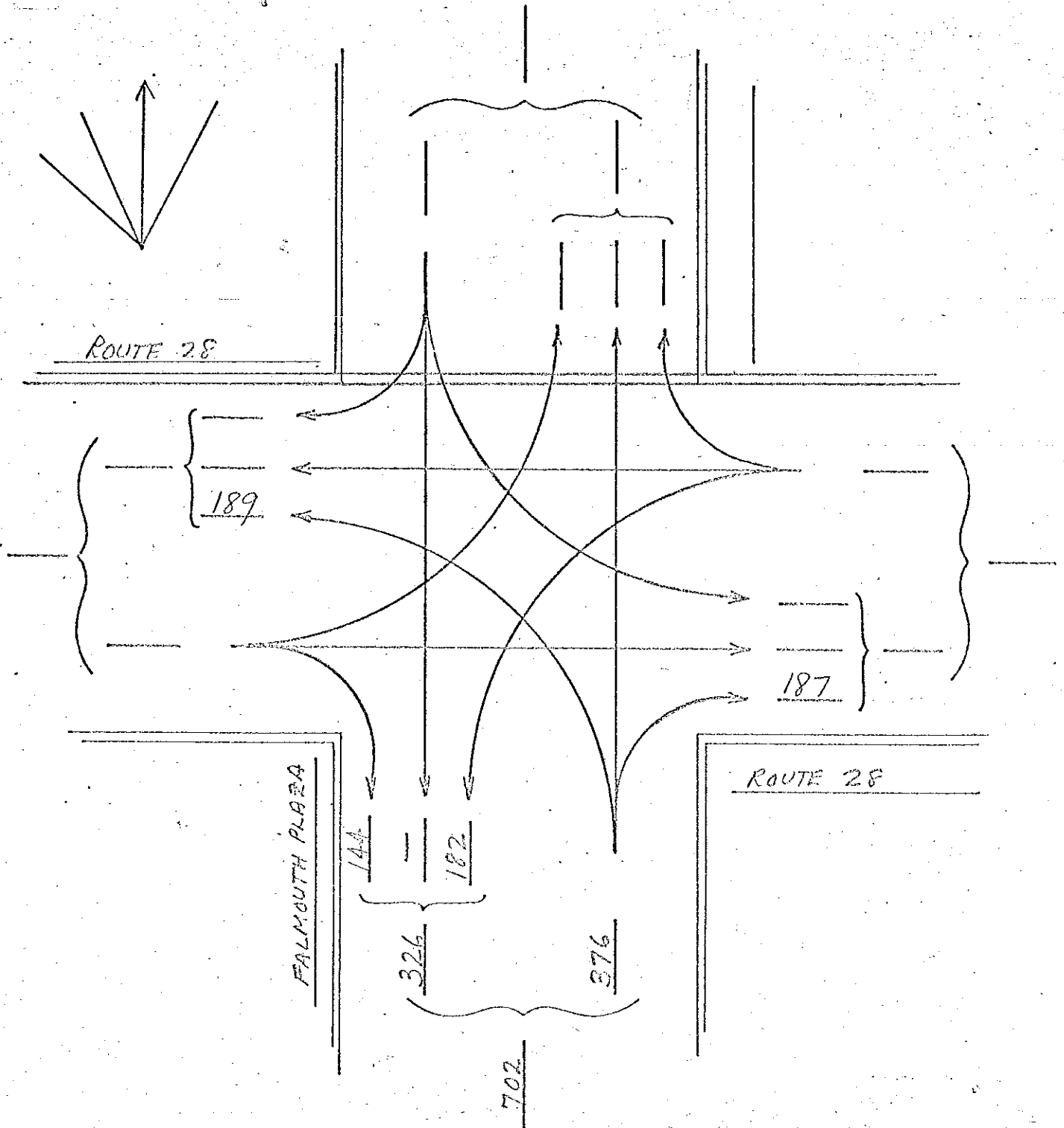
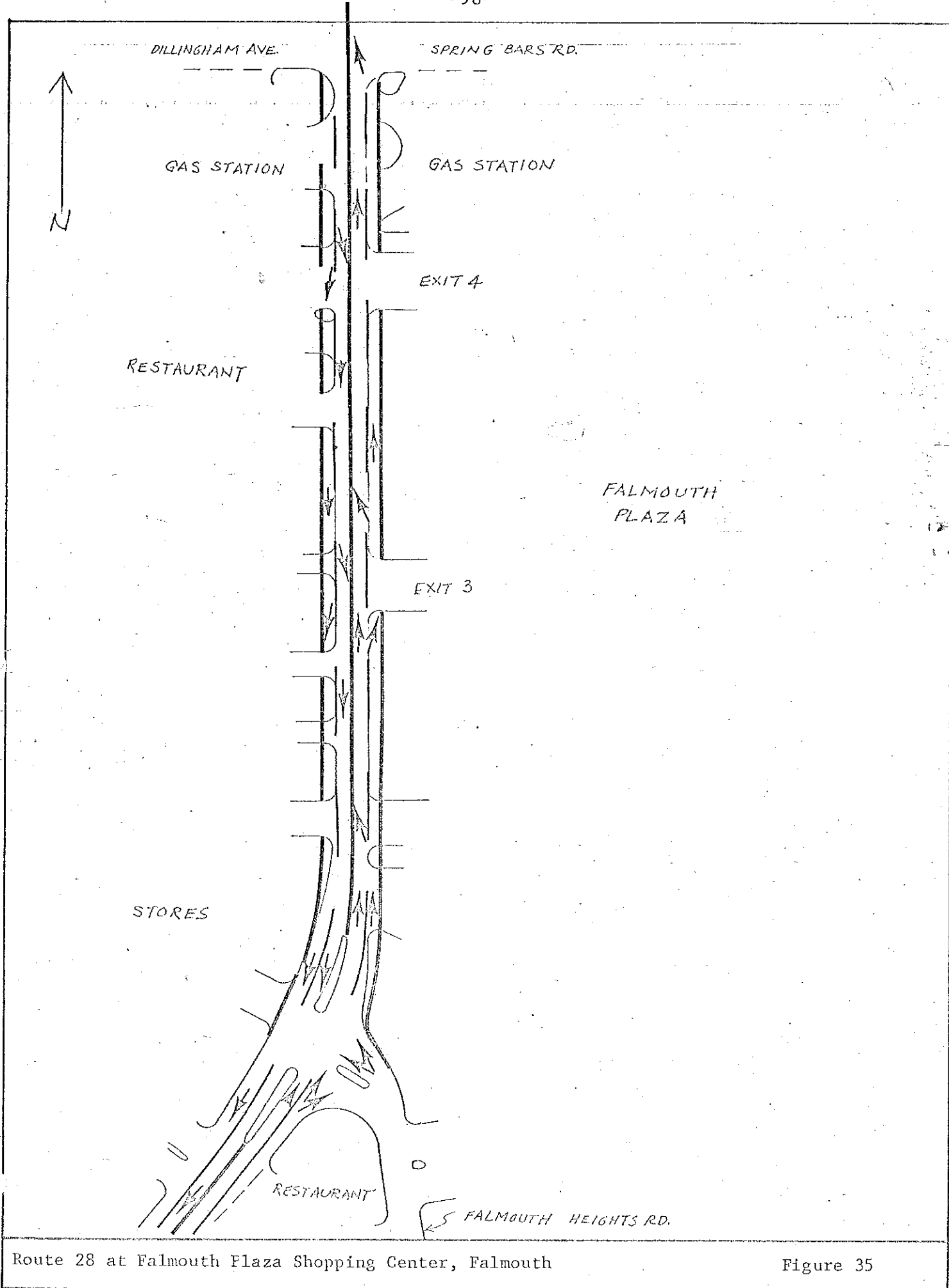


Figure 34



Route 28 at Falmouth Plaza Shopping Center, Falmouth

Figure 35

ESTIMATED COSTS

The cost of making the proposed improvements is a very real consideration. One of the goals of this study was to produce recommendations that were realistic in terms of their possible accomplishment in a short period of time. This necessarily meant that proposals have to be within the realm of town budgets and state financial capabilities. Intersections that obviously would require large sums of money were generally excluded in the selection process.

In looking at the figures in Table 1, it is evident that in a few cases minor improvements involving small sums of money will not work at some locations. For the most part, however, the estimated amount of money required for a project would not create insurmountable objection at a town meeting.

The estimates are very conservative--on the low side. In several cases the work might be done by town or state forces, eliminating the cost of elaborate plans, red tape and other added costs.

Finally an indication of primary responsibility has been noted so that town officials have some idea as to where pressure needs to be applied in order to effect proposed changes. In some cases responsibility may not be easy to establish. When this occurs, town officials must initiate the appropriate actions.

Preliminary Cost Estimate Summary

Cape Cod Traffic Operations Study

<u>Town</u>	<u>Location</u>	<u>Major Improvement Recommended</u>	<u>Estimated Cost</u>	<u>Primary Responsibility</u>
Barnstable	Park Square	Channelization, Pavement markings	\$ 1,500.	town
Bourne	Five Corners	Channelization, Pavement markings	25,000.	town
Brewster	Route 124 and Route 137	Upgrading of signs and Flasher	1,900.	town
Chatham	Route 28 at Red Barn Road	Add lane	18,500.	state
Dennis	Route 28 at School Street	Widen approach lane Signalization	4,000. 12,000.	state & town
Eastham	Route 6 at Governor Prence Road	Widening Route 6 and Signalization	25,000. 15,000.	state state
Falmouth	Route 28 at Falmouth Plaza	Roadway widening	85,000.	state & town
Harwich	Routes 137 and 39	Property changes	--	state
Mashpee	Route 130 Speed Zoning	Establish speed zone	1,000.	state
Orleans	Route 6A and Eldridge Park Way	Widen Route 6A	80,000.	state
Provincetown	Bradford Street & Standish Street	Channelization and markings	3,000.	town
Sandwich	Route 6A at Tupper Road	Add lane and channelization	12,000.	state
Truro	Route 6 and 6A	New sign series	5,000.	state
Wellfleet	Route 6 at Marconi Station entrance	Widening Route 6	15,000.	state
Yarmouth	Route 28 at South Sea Avenue	Access Control	10,000.	town

Note: The cost of land acquisition where necessary is not included in the cost estimate.